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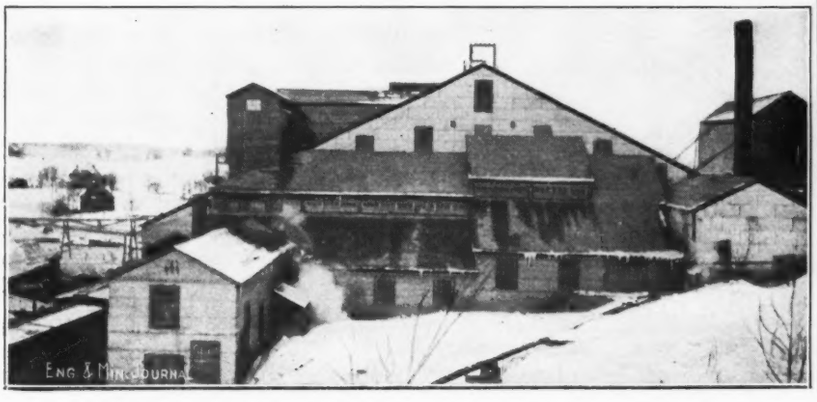
Mining in Northern New York

By P. B. McDonald*

In northern New York, between the Adirondack Mountains and the St. Lawrence River, lies an area of Pre-Cambrian rocks that has long been a mineral producer of some importance. The district is noted for the variety of minerals found. There the bulk of the fibrous talc used in American paper mills is mined and ground; one of the three principal pyrites mining companies of the country has its mines and mill; and the only zinc mine in New York state is situated. In addition, the district is an intermittent producer of iron ore, both magnetite and hematite; it mined and smelted lead ores in early days, and its quarries furnish the Gouverneur marble and Potsdam sandstone. In looking through "Dana's Mineralogy," one is surprised at the large number of minerals found in St. Lawrence and Jefferson counties, which comprise this area; besides those mentioned above, are garnets, apatite, graphite and brown tourmaline, in addition to many of no economic importance.

Zinc Mine and Mill of the Northern Ore Co., Edwards, N. Y.



Mill of the St. Lawrence Pyrites Co., Stellaville, N. Y.

Anna Shaft, St. Lawrence Pyrites Co.

Geology

The area is made up of highly metamorphosed crystalline rocks, generally striking northeast, parallel to the St. Lawrence River, and dipping to the northwest. The basement complex is called Adirondack gneiss; lying on this is the Grenville series of crystalline limestones, gneisses and schists of Pre-Cambrian age, with which most of the mineral deposits are associated. Intrusive into all of these formations are frequent igneous masses of light colored or reddish granite, which probably had considerable to do with the formation of secondary minerals. The region is essentially a foothill country with the harder gneisses and granites making rocky hills, while the limestone and softer schists make up flats and valleys, where dairy farming is carried on extensively. To the north and west of the Pre-Cambrian formations lies the Cambrian, represented by Potsdam sandstone; occasional

*Mining engineer, Gouverneur, N. Y.

patches of this are also found back on the older formations, especially in the valleys.

Economic Conditions

The Rome, Watertown & Ogdensburg branch of the New York Central lines traverses the district and has several small sub-branches extending to mining, lumbering and farming localities; the distance to New York is about 350 miles by rail. Good wagon roads are relatively plentiful and a number of small villages are scattered along the rivers and in farming sections. Cheap water power from the Oswegatchie and Raquette rivers has been an important factor in both mining and milling; nearly all the talc mines and mills are operated by their own water powers, and power can be purchased near the principal villages for about $30 per horsepower-year, as is done at the plant of the St. Lawrence Pyrites Co., near Hermon. Labor is plentiful and cheap, but usually inexperienced in mining so that miners are sometimes brought into the district.

Pyrites

Pyrite is found through a large belt extending from near Antwerp, across Gouverneur, Dekalb and Hermon townships, a district of over 40 miles, being the same belt which carries red hematite ores. Pyrite is generally disseminated through the "rusty" gneisses and schists, but occurs segregated in lenses or veins, constituting the workable deposits. The orebodies strike and dip in the same general direction as the inclosing gneisses, and are variable in shape and thickness. Two companies are now operating, the St. Lawrence Pyrites Co. with mines and concentrating plant between Hermon and Dekalb Junction; and the Cole mine, four miles northeast of Gouverneur, now operated by the Hinckley Fiber Co., of Hinckley, N. Y. The mines at High Falls or Pyrites, on the northeast end of the belt, have been taken over by the United States Steel Corporation and are not being worked.

The St. Lawrence Pyrites Co., controlled by Ladenburg, Thalmann & Co., of New York, has been producing for a number of years, and is ranked as one of the four principal companies in the United States producing pyrites. Its mines, better known as Stella mines, include two shafts on parallel deposits, 1600 ft. apart. The northwest shaft, known as the Stella, is not at present operated; at this mine, the orebody, averaging 10 ft. thick, extends 1100 ft. along the strike and has been worked 900 ft. down the dip of 20 to 30°; considerable pyrrhotite occurs in the ore. The Anna shaft, where present mining is in progress, is on a parallel lens about 1000 ft. in the foot wall of the Stella mine; the ore averages 20 ft. thick and has been followed 250 ft. down a 45° dip and 1200 ft. along the strike. The walls are not sharply defined and the merchantable ore fades gradually into rusty gneiss. Following the general rule of the entire district, the deposits strike northeast and dip to the northwest.

The ore carries from 15 to 40% sulphur with an average of about 21%. Practically all the mine output is concentrated; though a rather low-grade ore, it is free from arsenic and injurious impurities. The ore is put through a jaw crusher at the shaft house, from which it falls into bins and is loaded into railroad cars. The cars convey it to the mill, situated near the Stella shaft on a small creek. At the mill it is put through a gyratory crusher, trommels, and three sets of rolls, and is concentrated in two 25-ft. Hancock jigs; the tails from the Hancock jigs are treated in Harz jigs, and the fines are concentrated on 10 Wilfley tables and one Deister table, the latter treating the slimes. During the winter the concentrates are dried to prevent freezing, in a Ruggles-Coles cylindrical dryer. This consists of a nearly horizontal cylinder with another cylinder inside, the concentrates being passed between the two. The hot gases enter the inner cylinder at the end, where the concentrates are wettest, and return between the cylinders, where they come in actual contact with the material. The mill was designed for 500 tons capacity per 24 hr., which is sometimes exceeded, and reduces the mine's output about one-half in weight, sending out concentrates running about 44% in sulphur. The product is sold to sulphuric-acid manufacturers and to some extent to paper mills in the East; on account of the proximity of the St. Lawrence River (about 20 miles by rail) some of the material is transferred to boats at Ogdensburg and shipped up the Lakes. Trouble has been encountered from protests of residents because of pollution of the creek by mill tailings; to obviate this, a circular concrete settling tank has been constructed near the mill and housed in, the plan being to use the same water over again with only small additions from the creek.

Electrical power for complete operation of mill and mine is purchased from a hydro-electric company at a price of about $30 per horsepower per year. O. F. Pattberg is resident superintendent of the St. Lawrence Pyrites Co.'s plant.

The Cole mine, near Gouverneur, is a small mine, partially an open cut; only a depth of about 60 ft. has been reached. The ore is shipped crude, the shipments averaging 30% sulphur. One of the former leasers operated a small mill, later torn down by the St. Lawrence Pyrites Co., which held the lease at one time. The mine has recently been pumped out after several years of idleness, by the Hinckley Fiber Co., which uses the output in its paper mill at Hinckley, N. Y., for making sulphurous acid to be used in a sulphite pulp process. The ore appears to lie in two parallel bodies separated by 15 ft. of siliceous rock; the lower orebody was first worked as an open pit, and later through an inclined shaft. The upper orebody has been worked a little through a raise from the lower stope. The dip appears to be to the northwest and the strike northeast.

Talc

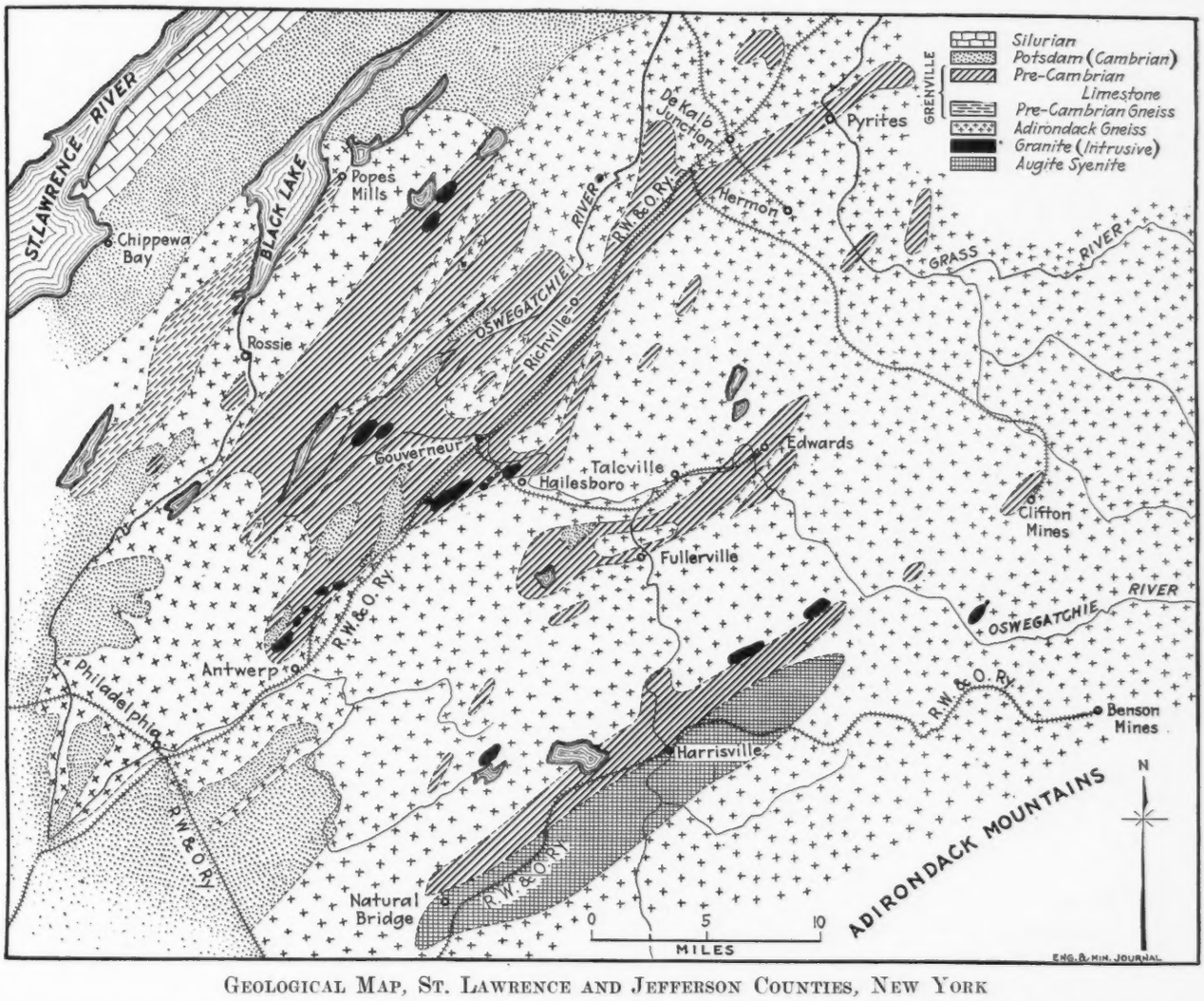
The mining and grinding of fibrous talc is an established industry in northern New York. It became important in 1880 and during the last 20 years, the value of the shipments from Gouverneur, the distributing point, has averaged about $500,000 yearly. Ground talc is used as a filler in the medium grades of paper for which purpose the bulk of it is produced; other uses are for waterproof paints and varnishes, steam-pipe coverings, wall plasters, talcum powders, soaps, etc. The great part of the ground talc used in American paper mills is distributed from Gouverneur, and several thousand tons are annually exported to Europe. There are usually two or three companies mining and milling in the Gouverneur district; the largest organization is the International Pulp Co., which operates three or four mines and as many mills.

Fibrous talc is found at various widely separated places in St. Lawrence and Jefferson counties, in association with siliceous, crystalline limestones and gneisses. The most important locality is a northeast-southwest belt of Grenville limestone, 12 miles long by one to three miles wide, near the villages of Talcville and Fullerville. At Talcville are situated the mines of the International Pulp Co. The talc occurs in bedded veins, having the same northeast strike and dip to the northwest as the including limestones and gneisses. The deposits are irregular, varying from a few inches up to 50 ft. in width with an average of perhaps 15 ft. The theory of formation advanced by C. H. Smyth, Jr., assumes the changing by metamorphism of limestone beds containing magnesia into tremolite schists, with the later alteration of the tremolite to talc through the agency of ground waters carrying CO_2; this makes the talc a pseudomorph after tremolite and explains its fibrous character.

The mine shafts are generally in the deposit, inclined at 30 to 60°, with levels 50 or 60 ft. apart. The best talc is stoped out, and the more impure portions are left as pillars, the amount left in the mine being probably 35 to 40%, so proportioned in different places as to keep the stopes from caving, at least for some time. Rock drills are used in mining, as the talc, although soft, is tough and compact; when blasted, it slabs off into large pieces which are sledged into smaller sizes and roughly sorted underground. The aim is to discard material containing much mica, silica, or other impurities, as the value of the finished product lies chiefly in its physical properties.

Hoisting is accomplished in skips which dump directly on flat cars at the railroad, except in the case of those mines situated several miles from the railroad, as at Fullerville, where transportation to mills is by wagons, which item increases the cost $1.50 or $2 per ton.

The mills of the International Pulp Co. are at Hailesboro, eight miles along the Gouverneur & Oswegatchie Ry. toward Gouverneur. The milling is relatively a more important process than the mining and requires close attention. The material must be watched carefully for grit and impurities, such as oil drippings. Owing to the necessity for fine grinding and to the low specific gravity of talc, no wet process has ever succeeded either for grinding or washing out the grit.



GEOLOGICAL MAP, ST. LAWRENCE AND JEFFERSON COUNTIES, NEW YORK

The talc is first crushed in a Blake crusher, from which it goes through rolls that reduce it to ½ in. or less. It then goes through a centrifugal grinder, of which the Griffin mill is a type, or through buhrstones, after which it is bolted through a 60-mesh screen. These reductions are only preliminary, as the greater part of the time is consumed in final grinding in revolving Alsing cylinders or tube mills. These contain a quantity of Danish flint

pebbles, about three times the weight of the talc charge, revolve 20 to 25 times per minute, and are lined with porcelain brick. The talc is ground in the cylinders from three to five hours, depending on the quality desired; owing to its fibrous, light character, it is difficult to size the ground talc by screening, hence the degree of fineness is regulated entirely by the duration of this final grinding process. The ground talc or "mineral pulp," as it is called, is packed in 50-lb. paper bags or 200-lb. burlap bags, and is shipped in box cars. Practically every mill and most of the mines are operated by their own water-power plants on the Oswegatchie River.

The problems of the process of producing ground talc for market are chiefly to secure a material free from grit and impurities and to grind it to a fine, homogeneous powder, without running up the cost too high. The finished product is sold for prices running from $7 to $10 per ton.

The only zinc mine in New York state is being developed at Edwards by the Northern Ore Co. There are two shafts at the mine, and a concentrating mill is nearly completed. A description of the mine and mill was published in the Feb. 15 issue of ENGINEERING AND MINING JOURNAL.

IRON ORE

The only producing iron mines in this part of northern New York at present are the magnetite mines at Benson Mines. Here, Pilling & Crane, of Philadelphia, have a magnetic concentrating mill for treating the product of the mines, which runs about 30% in iron. The plant was recently reopened after a period of idleness, but the problems of successful production have never been completely solved. The deposit is similar to the well known magnetite occurrences at Mineville, N. Y., and the industry may eventually become important.

Up to a few years ago extensive mining of hematite was carried on at Caledonia mines, between Antwerp and Gouverneur, near the railroad. The deposit was rather low grade and pockety, and underground development had not been properly started in early days. These disadvantages, combined with a long railroad haul to furnaces in southern New York and Pennsylvania, made the business unprofitable and it was discontinued.

Among other iron-ore mines that were active before Lake Superior ores came into strong competition, were the magnetite mines at Clifton Mines, closed since 1890. This ore and the Caledonia product were in early days smelted in small blast furnaces at Rossie, and at Fullerville. Rossie furnace went into blast in 1815, and Fullerville in 1833. Both have been abandoned for many years.

The distribution of iron ore, both magnetite and hematite, is extensive throughout northern New York. It is thought that the ores are derived from pyrites with which they are often associated. Under proper conditions iron mining may eventually become important.

MISCELLANEOUS MINERALS

Garnet was mined and concentrated one mile north of Gouverneur in 1902-03, and was sold for abrasive to be used in buffing leather. At the property there is a showing covering several acres of acidic igneous rock containing 20% of brown garnets about the size of peas. The competition of carborundum rendered the industry unprofitable and the mill was moved to the pyrites mine on the Cole farm.

Lead was extensively mined and smelted near Rossie in the period from 1837 to 1876, and during recent years lead mining was attempted in Macomb, northeast of Rossie. The ore is galena, associated with limestone.

Crystalline graphite occurring in Pre-Cambrian schists and gneisses has been mined to some extent near Pope's Mills during the last few years. The occurrence is similar to the mines in eastern New York, near Ticonderoga, but the operations were unsuccessful.

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Florida Phosphate Production in 1912

The production of phosphate rock in Florida for 1912 was 2,579,865 long tons, as compared with 2,494,572 long tons in 1911, according to the report of Dr. E. H. Sellards, state geologist. The production of hard rock in 1912 was 536,379 tons, as compared with 474,094 tons for the previous year. The output of pebble phosphate in 1912 was 2,043,486 tons as compared with 2,020,478 tons in 1911. Thirty companies in all were engaged in mining phosphate in Florida in 1912. Of these, 14 companies mined hard-rock phosphate, while 16 companies mined pebble phosphate.

The foreign shipments of phosphate rock from Florida during 1912 amounted to 1,203,005 tons. The amount consigned for domestic shipment, as reported by the producers, was 1,219,927 tons. It thus appears that approximately one-half of the phosphate mined in Florida is used in the United States. Hard-rock phosphate is said to have sold at the mines at about $6 per ton. Pebble phosphate sold at the mines at $2.75 to $4.50 per ton, depending upon the grade.

PHOSPHATE OPERATORS IN FLORIDA DURING 1912

Amalgamated Phosphate Co	25 S. Calvert St., Baltimore, Md., and Chicora, Fla.
Armour Fertilizer Works	Bartow, Fla.
Peter B. & Robert S. Bradley	92 State St., Boston, Mass., and Floral City, Fla.
J. Buttgenbach & Co	Holder, Fla.
Camp Phosphate Co	Ocala and Dunnellon, Fla.
Central Phosphate Co	Dutton, Fla.
Charleston, S. C., Mining & Manufacturing Co	Charleston, S. C., and Ft. Meade, Fla.
Compagnie Generale des Phosphates de la Floride	Paris, France, and Pembroke, Fla.
Coronet Phosphate Co	Lakeland, Fla., and 99 John St., New York.
Cummer Lumber Co	Jacksonville and Newberry, Fla.
Dominion Phosphate Co	Bartow, Fla.
Dunnellon Phosphate Co	Rockwell, Fla.
Dutton Phosphate Co	Gainesville, Fla.
Florida Mining Co	165 Broadway, New York, and Mulberry, Fla.
Florida Phosphate Mining Corporation	Norfolk, Va., and Bartow, Fla.
Franklin Phosphate Co	Newberry, Fla.
Holder Phosphate Co	Ocala and Iverness, Fla.
International Phosphate Co	27 State St., Boston, Mass., and Ft. Meade, Fla.
Interstate Chemical Corporation	Charleston, S. C., and Bowling Green, Fla.
Istachatta Phosphate Co	Istachatta, Fla.
Mutual Mining Co	Savannah, Ga., and Newberry, Fla.
Palmetto Phosphate Co	Baltimore, Md., and Tiger Bay, Fla.
The Phosphate Mining Co	55 John St., New York, and Nichols, Fla.
Pierce Phosphate Co	2 Rector St., New York, and Pierce, Fla.
Prairie Pebble Phosphate Co	165 Broadway, New York, and Mulberry, Fla.
Schilman & Bene	Ocala, Fla.
Southern Phosphate Development Co	Ocala and Inverness, Fla.
Standard Phosphate Co	Christina, Fla.
State Phosphate Co	Bartow, Fla.
T. A. Thompson	Neals, Fla.

The removal of overburden by hydraulicking is becoming general in the hard-rock section and has been an important factor in the increased production of rock. Electric lighting and power have made it possible to introduce day and night shifts in the Withlacoochee River mines. The overburden from the pebble rock is removed by steam shovel or by hydraulicking and the rock itself is mined by the same means. Many of the pebble mines run day and night shifts. The phosphate companies operating in Florida during 1912 are shown herewith.

Cyaniding at the Nevada Wonder Mill

By Herbert A. Megraw

SYNOPSIS—A cyanide plant situated at a distance from railroad communication resulting in high transportation costs. The crushing system includes heavy gravity stamps as a middle step, chilean mill and tube mill succeeding. El Oro lining is used in tube mill. Classification system includes cones for relieving load on the Dorr classifier. Pachuca tanks are used for agitating the pulp and the intermittent system is followed. Oliver filters are used with a preliminary pulp washing. Zinc shavings in the usual type of box are used for precipitating metals in solution. Extraction percentages are high, due to a docile ore.

The mine and plant of the Nevada Wonder Mining Co. is situated at Wonder, Nev., at a distance of about 63 miles from Fallon, which is its nearest railroad station. Communication is by means of wagons, for freight, and automobile stage for passengers and mail. As has already been mentioned in the case of the Nevada Hills company at Fairview, the isolated situation is responsible for high transportation charges and some measure of labor difficulties, the same condition applying at Wonder as at Fairview, but with somewhat more force due to the greater distance from communication.

The ores treated at Wonder are clear quartz of medium hardness and offer no special difficulties in crushing. The plant treats an average of about 110 tons per day of 24 hours, the mill run assaying about 18 oz. silver and 0.25 oz. gold.

For convenience the property is operated by two companies, the mining being carried on by the Nevada Wonder Mining Co. and the milling by the Churchill Milling Co.

In its present condition the mill embodies a great many changes from its original treatment plan, some of these changes having necessitated ingenuity in installing additional apparatus in space which was not designed to receive it. Such changes often force awkward arrangements, but in this mill most of them have been planned and instituted without mechanically embarassing results.

Heavy Stamps for Crushing

The ore from the mine, after being weighed, is passed through a 10x16-in. Blake rock crusher which delivers to an inclined belt conveyor, the latter delivering into the battery bin. The battery bin is of 2550 cu.ft. capacity and holds about 120 tons of ore.

From the bin the ore moves by gravity through gates into suspended Challenge feeders delivering into the mortars. It is noted by the operators that the one-stage crushing through a Blake-type breaker throws a somewhat heavy burden upon the stamps. The crusher allows a proportion of large pieces of rock to get through into the battery bins and these may at times cause difficulty in the mortars. Probably a better course is to crush in two stages, insuring a uniform feed of proper size for stamp crushing.

There are ten stamps of 1400 lb., each dropping 96 times per min. through 8 in. The mortars are of the narrow, rapid crushing type and are equipped with screens of the square-mesh variety having an aperture of 3/8 in. These stamps are relied upon in this instance to bear the heavy work of reduction, and the pulp from them is passed to one Monadnock chilean mill for the second stage. This mill makes 28 r.p.m. and is fitted with "ton-cap" screens having an aperture 0.08 in. wide.

Nevada Wonder Mill, Wonder, Nevada

Note—This is the thirteenth of a series of articles by Mr. Megraw on American cyanide practice. Previous articles appeared Nov. 2, Nov. 23, Dec. 14, Dec. 21, Dec. 28, 1912; Jan. 4, Feb. 8, Feb. 15, Feb. 22, Mar. 1, Mar. 8, and Mar. 29, 1913. The next article will deal with "Cyaniding at Republic, Washington," and will appear on Apr. 26, 1913.

Comparison of Time Lost in Repairs

It is worth while at this point to consider the relative time lost on account of repairs to batteries and the chilean mill. One of the strong points made by objectors to chilean mills is the time required to make repairs to them, the claim being that stamps keep on working all the time without any great loss due to renewals and repairs. A great many operators fail to take into consideration the fact that while the stamps seem to be working steadily and making a great deal of noise about it, it is rare in a mill containing any great number of them that there is not one or more hung up for adjustment, setting tappets, putting on a dropped shoe, aligning, or doing any one of a number of operations that are necessary with that class of machinery. When a small proportion of stamps are hung up it does not make any apparent difference in operations, for the mill is making just about as much noise as if they were all running, but it must be considered that each individual stamp is relied upon to crush a certain definite number of tons of ore in a year and every hour one stamp is out of commission has its effect upon the total product. On the contrary, if a chilean mill is stopped for repair the whole work is hung up, there is no noise and it seems necessary to make every effort to get it running again. The effect is to make it appear that the chilean is taking much more time for repairs than the stamps, whereas, if all the minor delays of stamps are added up they will usually approximate as much or more than those made necessary by the chilean mill. As an instance, at the Wonder mill during a period of a year the time lost for battery repairs amounted to 7.70 days and the chilean mill, 3.66 days. There is a 100% difference in favor of the chilean mill. And in this case it is to be remembered that the feed delivered to the chilean is too fine to insure maximum efficiency or economy of wearing parts. Personal experience has been that the chilean requires a percentage of coarser feed to do its best work and I believe most operators agree with that theory today.

Long Tube Mill in Use

From the chilean mill the pulp passes to a duplex Dorr classifier where the already slimed portion is taken out and the sand passed to a tube mill. This mill is 5x22 ft. and makes 28 r.p.m. It will be noted that this mill is of the long type, due to the fact that it was installed before the advantages of shorter tubes of the same diameter were recognized. The mill contains a lining of the El Oro type, one of the very few of these linings I have seen in use in the West.

Classification of the tube-mill product is somewhat involved and is an illustration of one of the changes made in the original mill design already mentioned. The stream from the mill is split into two parts, each going to a separate belt elevator, one of which sends its portion directly back to the Dorr classifier and the other delivering to a 5-ft. classifying cone. The underflow of this cone is returned to tube-mill feed and the overflow is taken to a 7-ft. classifying cone which takes out the coarser part as underflow and returns it to the elevator leading back to the Dorr classifier, and passes its overflow, slime, directly to the slime collector. The accompanying flow sheet shows the movement of the pulp and solution.

Pachuca Agitators Used

Slime is collected in a Dorr thickener, 24x14 ft., and the overflow solution passes to the precipitation department or to the battery tank. The thickened pulp is agitated intermittently in four Pachuca tanks, each 15x45 ft. The pulp receives about 40 hr. agitation in these tanks and the solution used is heated to about 80°. Solution used for treatment contains 4.5 lb. KCN and 4 lb. lime per ton. Due to the fact that the ore is clean and docile, high extractions are the rule, the average over the past year being 94.49% of the gold and 94.74 of the silver. This percentage of recovery is good, especially so on the silver, due to the raising of the temperature of the solutions. It has been proved in this mill that the extraction

COST OF MILLING AT WONDER, NEVADA

(Tons milled, 25,186—Period of one year.)

	Labor	Supplies	Power	Total
Superintendence	$3,686.65			3,686.65
Crushing and conveying	1,651.14	618.51	800.40	3,070.05
Stamps	3,173.41	1,577.98	2,658.55	7,409.94
Chilean mill	1,435.97	2,014.96	1,722.62	5,173.55
Tube mill	1,017.58	2,126.37	2,213.44	5,357.39
Elevating and separating	945.01	566.84	476.65	1,988.50
Agitating	6,722.84	15,775.08	1,660.12	24,158.04
Filtering	2,679.01	953.25	1,161.52	4,793.78
Precipitating	987.27	7,044.47	.....	8,031.74
Refinery	3,048.98	5,736.84	154.58	8,940.40
Concentrating	543.63	88.87	.....	632.50
Assaying	1,086.10	1,120.53	41.92	2,248.55
*Surface and plant	2,101.77	503.97	521.19	3,126.93
General	374.11	508.91	.....	883.02
Storehouse	677.59	383.42	39.89	1,100.90
Water and fire line	719.54	617.79	.....	1,337.33
Steam heat	1,721.62	5,293.14	.....	7,014.76
Traction engine	139.68	32.13	.....	171.81
Total direct	32,711.90	44,963.06	11,450.87	89,125.84
Indirect				
Office expense	1,371.48	822.39	.....	2,193.87
Company house	86.06	105.48	.....	191.54
Taxes and insurance	.....	.....	.....	2,933.61
Legal and traveling	.....	.....	.....	267.54
Total indirect	1,547.54	927.87	.....	5,586.56
Direct cost per ton				$3.538
Indirect cost per ton				0.222
Total cost per ton				3.760

* Refers to building repairs, outside lighting, removal of debris, etc.

falls off approximately 2% when the solution temperature is allowed to fall to or below 50° F. during treatment.

Continuous Filtration Followed

Pulp from the Pachuca agitation tanks is delivered to a stock tank, 28x14 ft., which is equipped with a mechanical agitator, and is diluted by the addition of 2 ft. of barren solution, and from this tank it is taken to a Dorr thickener. The overflow of this thickener goes to the precipitation department and the underflow of thickened slime is returned to the stock tank again. By this means the pulp is given a light washing and the content of the stock tank is maintained at a proper thickness for filtering.

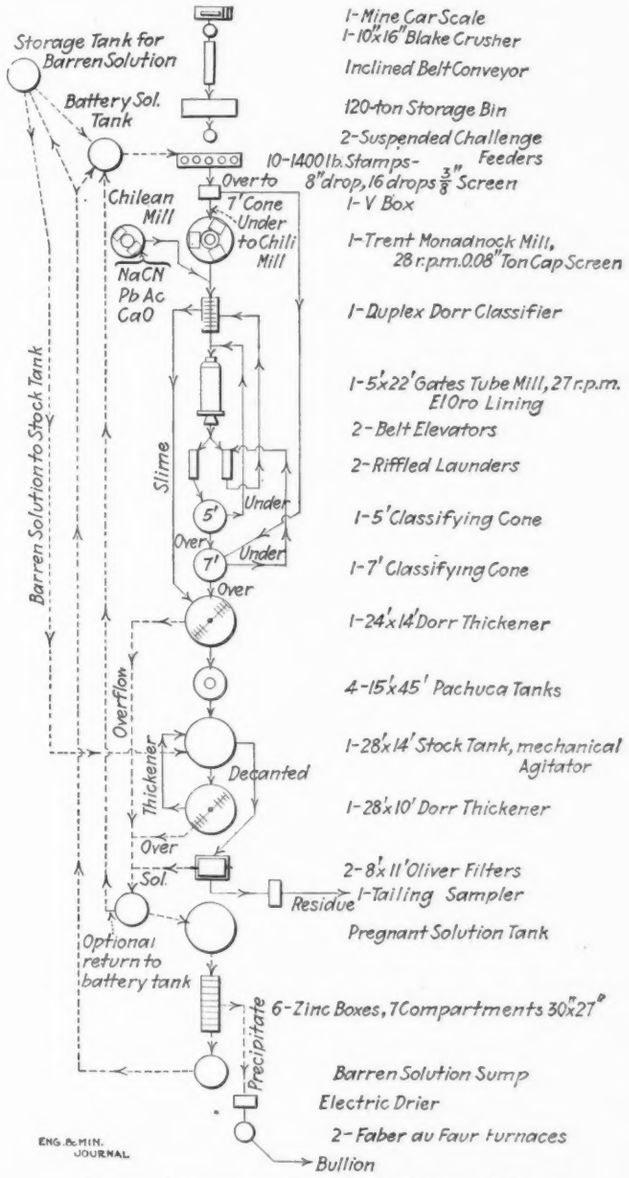
Oliver filters are used, and the pulp, having already received the preliminary washing mentioned, is filtered continuously, receiving a final wash at the filter. The wash water applied at the filter is led through hoses to a shaking pipe where it is sprayed on the cake in a constantly moving stream. By this means the delivery of the wash to any one point is avoided and a better distribution is accomplished. The discharge from the filter is said to contain about 50% moisture.

In this mill, as in many others, the centrifugal pump has proved a more economical and satisfactory method of moving slime pulp than the triplex slime pumps.

Zinc Shavings for Precipitation

Solutions from the Dorr thickeners and from the filters are passed to the pregnant-solution tank from which

the precipitation system is fed. There are six zinc boxes, each with seven compartments 30x27 in. area. Only five of these compartments are used for precipitation and the other two, at the heads of the boxes, are filled with excelsior and used for clarifying the solutions. Many of the Nevada mills are using excelsior for clarifying, as has already been mentioned in the case of the Tonopah mills, and it seems to do the work in a satisfactory manner.



FLOW SHEET OF NEVADA WONDER MILL

The precipitate cleaned up is dried in a pan which is fitted with electrical means for heating, and is then fluxed and melted in Faber du Faur furnaces burning oil. In order to avoid the melting of short zinc which accumulates, an acid tank has been installed and this material finds its way into the regular bullion production.

MATERIAL CONSUMPTION AND COST

Consumption of material at the Wonder mill is of cyanide, 1.6 lb. per ton of ore milled; of lime, 5 lb.; of acetate, 0.8 lb.; of pebbles, 3 lb. and of zinc 1.8 lb. A feature of interest is that the cyanide, lead acetate and lime required in treatment are all ground up together in a small chilean mill and added to the pulp flow between the chilean mill and the Dorr classifier. This is shown on the flow sheet.

The cost of milling is shown in the accompanying table, but it is to be remembered that the period of one year covered by these figures included 115 days lost due to lack of power and other less important causes, expenses naturally continuing to a large extent during that time. These expenses falling on the reduced tonnage show a cost abnormally high and it should be said that during the last two months when the mill was operating at its maximum rated capacity of approximately 110 tons per day, the expense dropped to about $2.75 per ton.

Considering the situation of the mill and the difficulties under which the operators have been working, the results obtained are extremely creditable.

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Air Compressor Explosions

BY LINDSAY DUNCAN*

In view of the number of air-receiver and air-compressor explosions within the last few months it seems that a short statement of the theory of explosions in general and air-compressor explosions in particular would be appropriate. The destructive effects of an explosion are due to the large volume of gas generated by a quick combustion which causes, if confined, a great and sudden increase of pressure.

CONDITIONS FOR COMBUSTION AND EXPLOSION

For combustion three conditions are necessary: A combustible substance, a supporter of combustion, and a temperature sufficient to ignite the mixture. For a combustion to be an explosion the combustible must be finely divided, permitting practically instantaneous ignition of the entire mass, and the proportion of the combustible matter to air or oxygen must be within certain limits. In case any one of the above conditions is not fulfilled, an explosion will not occur.

In discussing the above conditions the first two, i.e., a combustible substance and the presence of oxygen are too obvious to require comment. The third condition, the ignition temperature, varies with the nature of the combustible substance, for example, phosphorus will ignite at a temperature of 140° F., nitroglycerin at 360°, sulphur at 480°, acetylene at 510°, illuminating gas at 800°, and solid carbon from 600° to 1300°, according to the fineness of division of its particles.

The proportion of combustible matter and oxygen also depends upon the character of the combustible. Ordinarily the proportion of oxygen which will completely oxidize the elements composing the combustible causes the most violent explosion. Illuminating gas explodes most violently when mixed with seven times its weight of air. When the proportion of gas is reduced from 12.5% to 7%, or increased to 16%, there will be no explosion under ordinary conditions. Methane explodes most violently when it constitutes 6% by weight of the mixture of air and gas. If the proportion decreases to 3% or increases to 13% there will be no explosion. With finely divided carbon the most violent explosion occurs when

*Mechanical engineer, McGill, Nev.

the weight of the carbon is 8% of the total. It is thus seen that the limits within which an explosion can occur under atmospheric pressure are comparatively narrow. When the pressure is increased above the atmosphere, say 100 or 150 lb. per sq.in., it is possible that the limits within which an explosion could occur might be considerably increased. I have, however, been unable to discover any data bearing upon that point, and it would seem to be an interesting field for research.

The Combustible Must be Finely Divided

As to the final requirement for an explosion, i.e., that the combustible substance shall be finely divided, this condition is fulfilled by any gas, by a liquid in the form of a spray and by a pulverized or a porous solid.

In an air compressor the only combustible substances introduced into the air cylinders are in the oil used for lubrication and the causes leading to explosions must be sought in the behavior of the oil under the conditions of heat and pressure which may prevail within the cylinder.

The combustible may be either a vapor, a liquid, or a solid. Taking these possibilities in their order we find that vapor is given off by all oils at their flash points, but only in small quantities and it is necessary to attain and maintain the boiling point for a considerable period of time in order to vaporize the oil. All vapors and gases are swept from the cylinder with each stroke of the piston and so only the vapor generated in a single stroke of the piston is available for an explosion.

The boiling point of air-cylinder oils is between 600 and 700° F. and very little vapor is given off below that point. Moreover, in order to supply enough oil to furnish vapor enough to create an explosive mixture during a stroke of the compressor the oil would have to be fed in at a tremendous rate, say 15 gal. an hour in a moderate sized machine or about 10,000 times as fast as good practice warrants. The temperature of 700° F. is practically impossible to maintain without the valves or piston sticking and the machine exhibiting those signs of distress which are familiar to anyone who has operated an engine with superheated steam.

It would appear to me that the probability of an explosion being caused by oil vapor is exceedingly remote. As to the probability of the oil igniting while in a liquid form the conditions of fine division and temperature of ignition seem impossible of attainment. Turning now to to the only remaining type of combustion, a finely divided solid, we find conditions for an explosion much more favorable. The solid, which will necessarily be carbon, may separate out from the oil from time to time until sufficient carbon accumulates to make the proper proportion for an explosion. The proportion by weight of carbon and air for complete combustion is 1 to 11½, but by volume it is 1 to 18,580, or a cubic inch of carbon will combine with 10¾ cu.ft. of free air. Take, for example, a thousand-foot compressor with the low-pressure cylinder, 21 in. in diameter and an 18-in. stroke. This has a content of 3.6 cu.ft., and so one-third of a cubic inch of carbon is sufficient to create a violent explosion.

Finely divided carbon will ignite at a temperature of 600°, and it possesses the property of generating heat by occluding oxygen upon its surface, a familiar example of the result which is the spontaneous combustion of coal in storage. With the finely divided carbon subjected to continuous heat and pressure, it is quite probable that combustion may take place at a temperature much below 600° F., possibly as low as 300°. Adiabatic compression to 10 atmospheres with an initial temperature of 90° F. gives a final temperature of 600° F. As 10 atmospheres at 6000 ft. altitude represent 100 lb. gage pressure, it follows that an explosion might readily occur in any high-altitude compressor using a carbonizing oil, if the cooling water were cut off from the jackets and intercooler.

An understanding of the cause of explosions renders their prevention a comparatively simple matter. The cylinder temperature must be kept low and no carbon allowed to accumulate. Water jacketing and intercoolers will keep down the temperature, but accidents to the piping are liable to happen, so it is essential to keep out the carbon.

Use an oil which does not precipitate its carbon contents, observe the valve decks at frequent intervals and keep trying different brands until a satisfactory oil is secured. Use as little oil as possible and feed soapy water through the lubricator at regular intervals. In keeping down the quantity of air-cylinder oil used I have found that a mechanical lubricator, such as the Manzel or Richardson-Phoenix, is a paying investment on a compressor as the oil is fed in at a certain rate per stroke. A compressor which has been running at the power house of the Nevada Consolidated Copper Co. 24 hr. per day for the last five years is compressing 16,000,000 cu.ft. of free air per gallon of lubricating oil and without bad effects on the machine.

The amount of carbon shown in an oil by chemical analysis has little or no connection with the amount of carbon which precipitates out under heat and pressure, and a high flash point is of no advantage to an air oil. If carbon deposits are not permitted in the air cylinders and an efficient system of cooling is maintained, there will be no compressor explosions.

Bismuth Analysis

A brief description of bismuth minerals and account of the distribution of bismuth ores, their properties and uses is published in *Bull.* Imp. Inst., 1912, 10, and reprinted in abstract in *Journ.* Soc. Chem. Ind., Feb. 28, 1913. In the accompanying table is given the percentage composition of crude and refined bismuth as produced in some of the most important centers:

	Crude Bismuth			Refined Bismuth	
	Australia	Bolivia	Peru	Saxony	
Bismuth	96.2	99.05	93.57	99.74	99.98
Antimony	0.8	0.56	4.57	.....	.....
Arsenic	trace	.....	.....	0.01	trace
Copper	0.5	0.26	2.06	0.02	0.03
Lead	2.1	.....	.....	0.11	0.06
Iron	0.4	.....	.....	trace	trace
Sulphur	....	.....	.....	0.04	.....
Silver	....	0.08	.....	0.07	.....

Highest and Lowest Points in the World—The maximum difference in elevation of land in the United States is 14,777 ft., according to the U. S. Geological Survey. Mount Whitney, the highest point, is 14,501 ft. above, and a point in Death Valley is 276 ft. below sea level. These two points, which are both in California, are less than 90 miles apart. Their difference is small, however, as compared with the figures for Asia. Mount Everest rises 29,002 ft. above and the shores of the Dead Sea are 1290 ft. below sea level, a total difference in land heights of 30,292 ft. Mount Everest has never been climbed. The greatest ocean depth yet found is 32,088 ft., at a point about 40 miles north of the island of Mindanao, in the Philippine Islands. The ocean bottom at this point is therefore more than 11½ miles below the summit of Mount Everest. The difference in the land heights in Europe is about 15,868 feet.

Standardization of Electric Equipment

SYNOPSIS—Rules drafted by American Mining Congress Committee to promote safety, economy and efficiency in the methods of installing and operating underground electrical equipment in metal mines. The application of electricity to power, lighting, signaling, telephones and blasting is covered.

The following report prepared by the American Mining Congress committee on the standardization of electrical equipment in metal mines, was presented to the Spokane convention and ordered to be printed in the *Bulletin* in order that the committee might have the advantage of any criticisms or suggestions through which their recommendations might be made more perfect. All persons are requested to make such suggestions to the chairman of the committee, H. S. Sands, Gas and Electric Bldg., Denver, Colorado.

It is planned to follow with this report the same course followed by the committee on the standardization of electrical equipment in coal mines, whose report after the receipt of many suggestions was amended, and in its amended form has been adopted by the Legislature of Pennsylvania as a part of the state law. It is hoped that the report which follows, either in its present form or with such amendments as may be found desirable, may be made a part of the law in the metal-mining states.

The committee consisting of H. S. Sands, Charles A. Chase and Frank E. Shepard, states that it was their intention to compile a set of rules sufficiently broad to work no hardships on anybody and sufficiently exacting to bring about installations that would not only be safer but more economical and efficient than has been the general practice in metal mines. The committee is indebted to Dr. Rosea for his valuable work along similar lines.

Copies of the preliminary rules were submitted to the following for criticism: D. C. Jackling, W. H. Staver, W. J. Canada, P. C. Schools and G. B. Rosenblatt, and many valuable suggestions made by them were incorporated with the proposed rules.

The rules as formulated follow:

Definitions

The expression "pressure" means the difference of electrical potential between any two electrical conductors.

(1) *Low Pressure*—Where the conditions of the system are such that the pressure between any two conductors, or between any conductor and the earth, at the terminals where the electricity is being used cannot exceed 300 volts, this shall be deemed a low-pressure system.

(2) *Medium Pressure*—Where the conditions of the system are such that the pressure between any two conductors, or between any conductor and the earth, at the terminals where the electricity is being used, can exceed 300 volts, but cannot exceed 600 volts, this shall be deemed a medium-pressure system.

(3) *High Pressure*—Where the conditions of the system are such that the pressure between any two conductors, or between any conductor and the earth, at the terminals where the electricity is being used, can exceed 600 volts, this shall be deemed a high-pressure system.

Sec. 1—Distribution System

Rule 1—Switching Station—Where the generating station or substation is more than 500 ft. from the entrance to the tunnel or shaft, a switching station shall be installed at the entrance to the tunnel or shaft for cutting off the power from each circuit.

Rule 2—Hoist—The circuit feeding electric hoists used for raising or lowering men shall be separate from all other circuits and shall run from the distribution center, and no other electrical apparatus shall be connected thereto.

Rule 3—Lightning Arresters—Where the circuits entering the shaft house or tunnel are from an overhead transmission system each circuit shall be protected by lightning arresters, which shall be grounded to efficient grounds prepared for that purpose.

Rule 4—Grounding—All alternating-current systems in which the normal working pressure does not exceed the limits of medium pressure, and all three-wire direct-current systems shall be grounded. In alternating-current power systems where the voltage does not exceed medium pressure and where the secondaries of the transformers are connected in star, then the neutral or center of the star shall be grounded. Where the distribution system is delta or open delta, then the central point of one transformer shall be grounded. Where the distribution is three-wire direct current, then the neutral shall be grounded. The wiring for signal or telephone circuits shall be placed on the opposite side of the manway, shaft or tunnel, from the power or light wiring.

Rule 5—Underwriters—All wiring shall conform to the rules of the National Board of Underwriters.

Rule 6—Shaft Wiring—All power wires whose pressure does not exceed medium pressure shall be run where possible in the manway or the compartment of the shaft where hoisting does not occur, and shall be either lead armored cable, or run in waterproofed or drained conduit. If the lead armored cable is used the insulation must be nonhydroscopic and as acid proof as possible. The cable shall be held in place by frequent fastenings spaced according to the weight of the cable so that the cable is firmly and securely held in place and there is no danger of the cable "dragging." The lead covering of the cable must be grounded. If the wires are run in conduit, junction boxes shall be placed at every level, and in no case shall the interval between boxes exceed 150 ft. These junction boxes shall be held in place and provision made to hold the weight of the wire in the conduit leading to the junction box below, on insulated supports. The iron conduit must be grounded.

Rule 7—Power Wires—All power wires whose pressure exceeds that of medium pressure shall be of either lead armored cable or incased in iron or steel conduit or other approved nonhydroscopic conduit; in any case metal covering shall be well grounded with wire at least one-half the size of the largest wire in the cable or conduit.

Rule 8—Joints—All joints must be electrically efficient, mechanically strong, and soldered unless approved

solderless joints are used. All joints except in trolley wires, should be taped or otherwise suitably insulated to protect them from corrosion.

Rule 9—Bushings—Where unarmored cables or wires pass through metal frames or into boxes or motor casings, the holes shall be substantially bushed with insulating collars.

Rule 10—Sectionalizing—Wherever branch electric circuits leave a main or secondary feeder, cutouts and switches shall be provided for disconnecting the branch line from the supply line, and all main and distributing feeders shall be provided with sectionalizing switches at distances not exceeding one mile. All cutouts above ground to be in approved metal cabinets and under ground in subway-type cabinets.

Rule 11—Switches, Circuit-Breakers, Fuses—All switches, circuit-breakers and fuses must have bases of marble, slate or porcelain, or other suitable incombustible nonhydroscopic material, free from metallic veins, and shall be placed in as dry a situation as practicable.

Rule 12—Circuit-Breakers, Fuses—Fuses and automatic circuit-breakers should be so constructed or adjusted as to open the circuit when the current through them exceeds not more than 100% of the working current in the case of motors, or by not more than 30% of the permissible current of the cables which they protect. Fuses shall be stamped or marked, or shall have a label attached indicating the current at which they are intended to fuse. Fuses shall be adjusted or replaced only by a competent person, authorized by the mine superintendent.

Rule 13—Grounds—The rails of the haulage system and the air and water pipes shall be connected together wherever practicable so that the efficiency of the "ground" may be bettered and where the formation is such that good electrical grounds cannot be obtained, then the tracks, and air and water pipes, shall be connected to a good and well-prepared ground at the mouth of the tunnel or collar of the shaft as the case may be.

Sec. 2—Apparatus

Rule 14—Sizes and Capacity—All electrical apparatus shall be sufficient in size and capacity for the work it may be called upon to do, and so installed, operated, maintained and safeguarded as to reduce the danger from accidental shock or fire or overheating to the minimum, and shall be of such construction and so operated that the rise in temperature caused by ordinary working will not injure the insulating materials.

Rule 15—Grounding—All electrical apparatus, that is, motors, transformers, generators, and their switching devices installed underground shall have their frames well grounded.

Rule 16—Portable Motors—A higher pressure than medium pressure shall not be used for portable motors.

Rule 17—Transformers—Where pressure higher than medium pressure is used in connection with transformers installed underground they shall be installed in a dry, well ventilated, fireproof room or compartment or station so arranged that it can be entirely closed with fireproof doors should any accident occur, and the fire arising from the accident be smothered.

Rule 18—High-Pressure Motors—No motors of less than 15 hp. shall be used on circuits of higher than medium pressure.

Rule 19—Switches and Fuses—All motors, together with their starting resistance or induction starter, as the case may be, shall be protected by fuses and switches or by automatic circuit-breakers capable of entirely cutting off the current and these must be in sight of the motor.

Rule 20—Trailing Cable—In the event of the trailing or portable cable in service breaking down or being damaged, or of its inflicting a shock upon any person, it shall at once be put out of service and shall not be used again until it has been repaired and tested by the mine electrician or assistant mine electrician.

Sec. 3—Electricians

Rule 21—Employment of Mine Electricians—At every mine where electricity is used below ground, a competent mine electrician and, where necessary, an assistant mine electrician also, shall be employed, subject to the authority of the mine superintendent. The electrician shall have full charge of all electrical apparatus used in connection with the mine. Every person appointed to operate any electrical apparatus in connection with a mine shall be instructed in his duty by the mine superintendent or electrician before taking charge of the apparatus.

Rule 22—Inspection of Wiring—It shall be the duty of the mine electrician to inspect all wiring and apparatus once every 10 days, and once each month to make report of such inspections in writing to the superintendent, stating all defects found and how repaired.

Sec. 4—Protection

Rule 23—Fire Buckets—Fire buckets filled with clean, dry sand shall be kept where stationary electrical apparatus is located, ready for immediate use, and regularly inspected once every month. The provision of tetrachloride fire extinguishers is recommended.

Rule 24—Resuscitation—Instructions shall be placed at the mine entrance, and in every generating, transforming, and motor house, for the resuscitation of persons suffering from electric shock. All employees operating the electrical apparatus shall be required to acquaint themselves with these instructions.

Rule 25—Recording Accidents—Every personal accident occurring in connection with the operation of the electrical equipment shall be promptly reported by the person injured, or by some other person on his behalf, to the mine superintendent, and shall be recorded by him at the office of the mine.

Rule 26—Plans—A plan on a scale not smaller than 200 ft. to the inch shall be kept at the mine, showing the position of all permanent electrical machinery and fixed cables or conductors in the mine, and shall be corrected as often as may be necessary to keep it as nearly as practicable up to date, and never more than six months in arrears.

Sec. 5—Haulage

Rule 27—Location of Wires in Roadway—In underground roads, the trolley wires shall be placed as close to the side, and as straight as practicable, and securely supported at frequent intervals. In all roads where it is necessary for men to travel on foot, all wires, except signal wires, must be placed on the same side of the roadway. The trolley wire shall not be less than six feet from the top of the rail unless protected from casual contact of passersby by suitable shield or trough.

Rule 28—Protection of Cables—Where the cables in main haulage roads, where persons are hauled into or out of the mines cannot be kept at least 18 in. from any part of the car, they shall be specially protected. Cables and wires, unless provided with metallic coverings, shall not be fixed to walls or timbers by means of noninsulating fastenings. Where main or other roads are being repaired, or where blasting is being done, temporary protection must be used so that the cables are protected from damage.

SEC. 6—LIGHTING AND SIGNAL WIRES

Rule 29—Erection of Lighting and Signal Wires—Small wires for lighting or signal circuits shall either be conveyed in pipes or casings, or they may be suspended from porcelain or glass insulators or securely tied to them, so that they do not touch any timbering, rock or metal. On no account shall staples be used. If metallic pipes are used, they must be grounded and well drained. If separate unincased wires are used, they shall be kept at least three inches apart, and not brought together except at lamps or fittings.

SEC. 7—BLASTING

Rule 30—Shotfiring—Electricity from light and power circuits shall not be used for firing shots in a mine except where the electrical connection to such light or power circuit is made within an inclosed switch room, which shall be kept securely locked and shall be accessible only to the authorized shotfirer. If electricity from light or power cables is used for firing shots in a mine, no shots shall be fired until all the men are out of danger. Special precautions must be taken to prevent accidental contact between shotfiring cables or wires and power and lighting cables. Only persons authorized in writing by the mine foreman or superintendent are permitted to fire shots electrically in a mine.

Rule 31—Battery or Magneto Exploders—Where battery or magneto exploders are used, they shall be inclosed in a suitably constructed box, fitted with a removable connecting plug or key without which the circuit cannot be closed. This plug or key shall be detached when not required for firing, and shall not under any conditions pass from the personal custody of the shotfirer while on duty. Exploders shall be frequently tested by the shotfirer to insure that they give the necessary pressure and current. The exploder shall not be connected to the shotfiring cable until all other steps preparatory to the firing of the shot have been completed and all persons have removed to a place of safety. Immediately after the firing of the shot the firing cable shall be disconnected from the exploder, and no person shall approach a shot that has been attempted to be fired by electricity and has failed to explode until the firing cable has been disconnected and an interval of five minutes has elapsed since the last attempt to fire the shot.

SECTION 8—TELEPHONES

Rule 32—Telephone Systems, When Required, How Installed—All mines from which exit is by shaft only, and all others in which the working places extend more than one mile from a place of exit, shall be provided with an underground telephone system, provided the number of underground employees at any one time on the regular working force exceeds 25. The system shall be of approved construction, and of such extent that no working place shall be at a greater distance than three-fourths mile from a telephone; principal shaft stations shall be provided with telephones. All main telephone cables shall be insulated with waterproof insulation, and unless run through metal pipes or casings, or approved conduit, they shall be protected by a continuous lead sheath.

The Mining Industry in Formosa

Gold and coal are the most important mineral productions of Formosa. In 1911, according to Vice-Consul J. W. Valiantine (*Daily Consular and Trade Reports*, Feb. 19, 1913), Formosa had the following mines: Lode gold, 9; gold and copper, 1; placer gold, 27; coal, 270; petroleum wells, 39; sulphur, 16. The output was valued at: Gold, $1,069,500; silver, $32,525; copper, $264,513; coal, $468,367; petroleum, $3243; sulphur, $22,950. Of the gold mines enumerated, only three are productive.

In the 10 years up to 1911 the production of placer gold decreased from $300,000 to $25,000. There are known 15 seams of coal, of different varieties. While 300 wells have been drilled in an attempt to obtain petroleum, the only one actually productive is the Shukkoku owned by the Hoden Oil Co. Of the total output of Formosa mines, 98% comes from the Prefecture of Taihoku. Formosa is divided into three geological belts of which the western, about 20 miles wide, contains no mineral deposits; the middle, of Tertiary formation, about 15 miles wide, contains all of the mineral deposits productive at present; and the third, which includes about one-half of the island and consists of high mountain ranges, has been little prospected.

Damages under the Cowles Patent

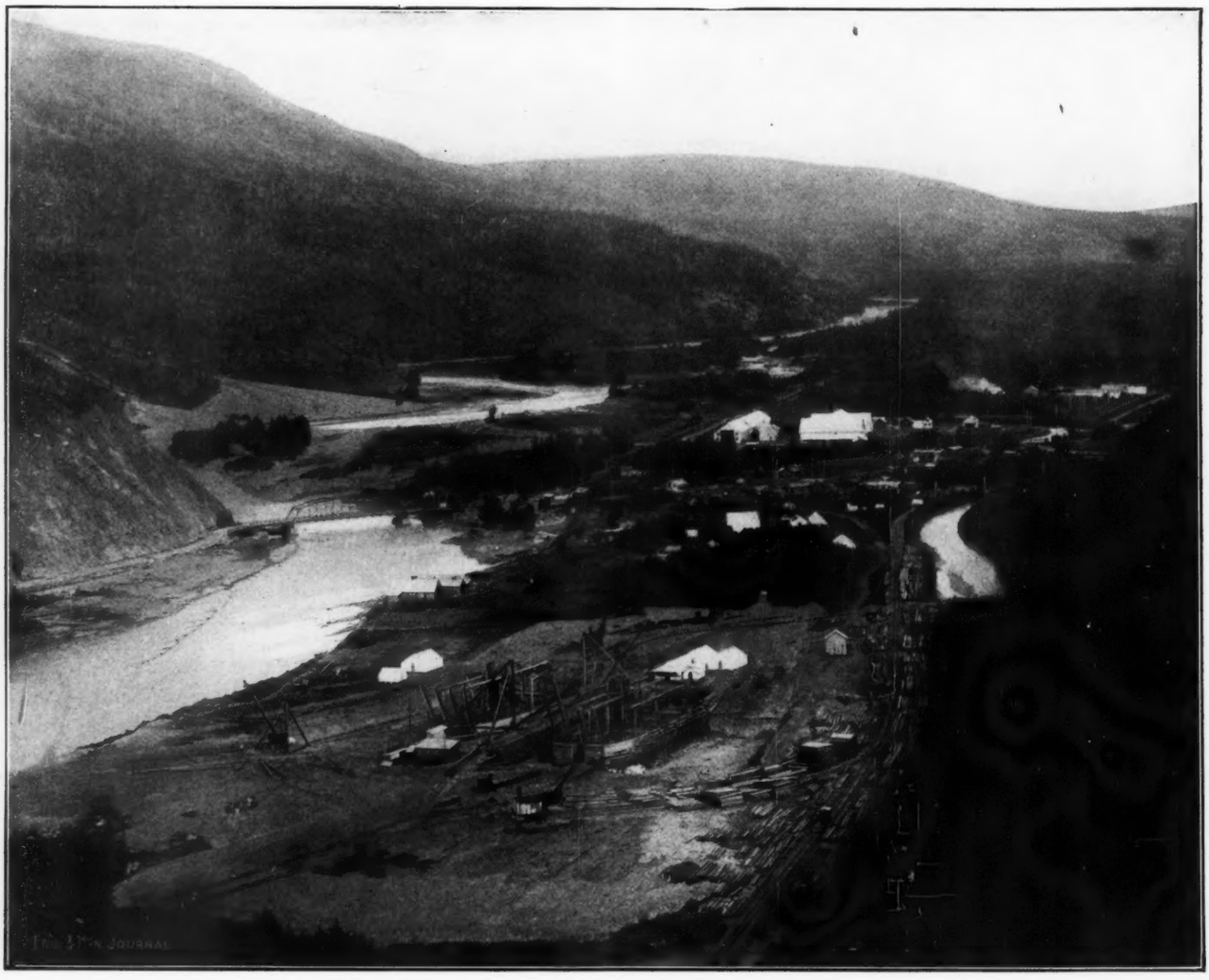
The damage suits brought by the Electric Smelting & Aluminum Co. against the Carborundum Co. for infringement of the Cowles patents have been decided by the Circuit Court of Appeals, at Philadelphia, at all points in favor of the plaintiffs. The decision of the court sustaining the Cowles patents was rendered 13 years ago, and the case was sent to a master to assess damages for the infringement. The master found that the profits due the Electric Smelting & Aluminum Co. for infringement prior to Jan. 1, 1900, amounted to $88,743, with interest from the date of the master's report.

After Jan. 1, 1900, the Carborundum Co. slightly modified its methods of operating the furnace, and the master ruled that it ceased then to infringe, and no accounting was made from that date. The Circuit Court of Appeals reverses this finding of the master and permits the Electric Smelting & Aluminum Co. to continue the accounting up to June 9, 1902, the date of the expiration of the patent.

The Court reaffirmed its earlier decision that the Cowles brothers produced carborundum in their furnace; that it was exhibited at a public lecture before the Boston Society of Arts and samples left in the Museum of the Massachusetts Institute of Technology three years before the so called discovery. The present litigation was begun in 1894.

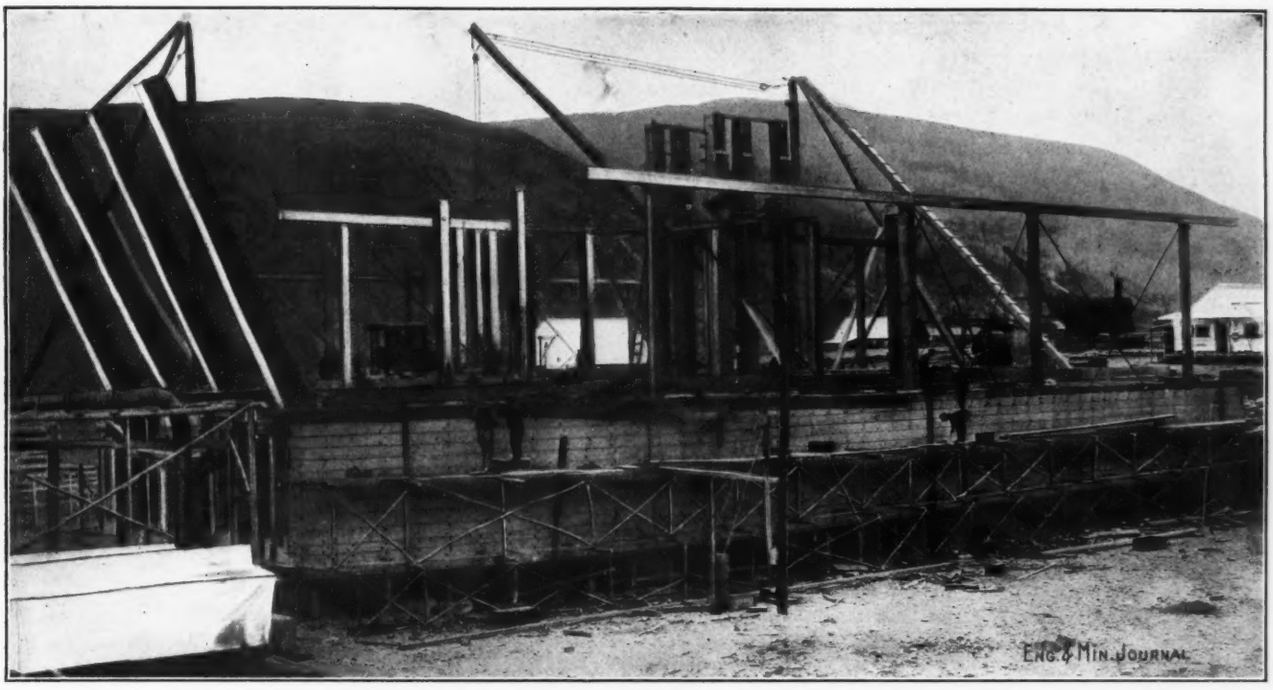
PHOTOGRAPHS FROM THE FIELD

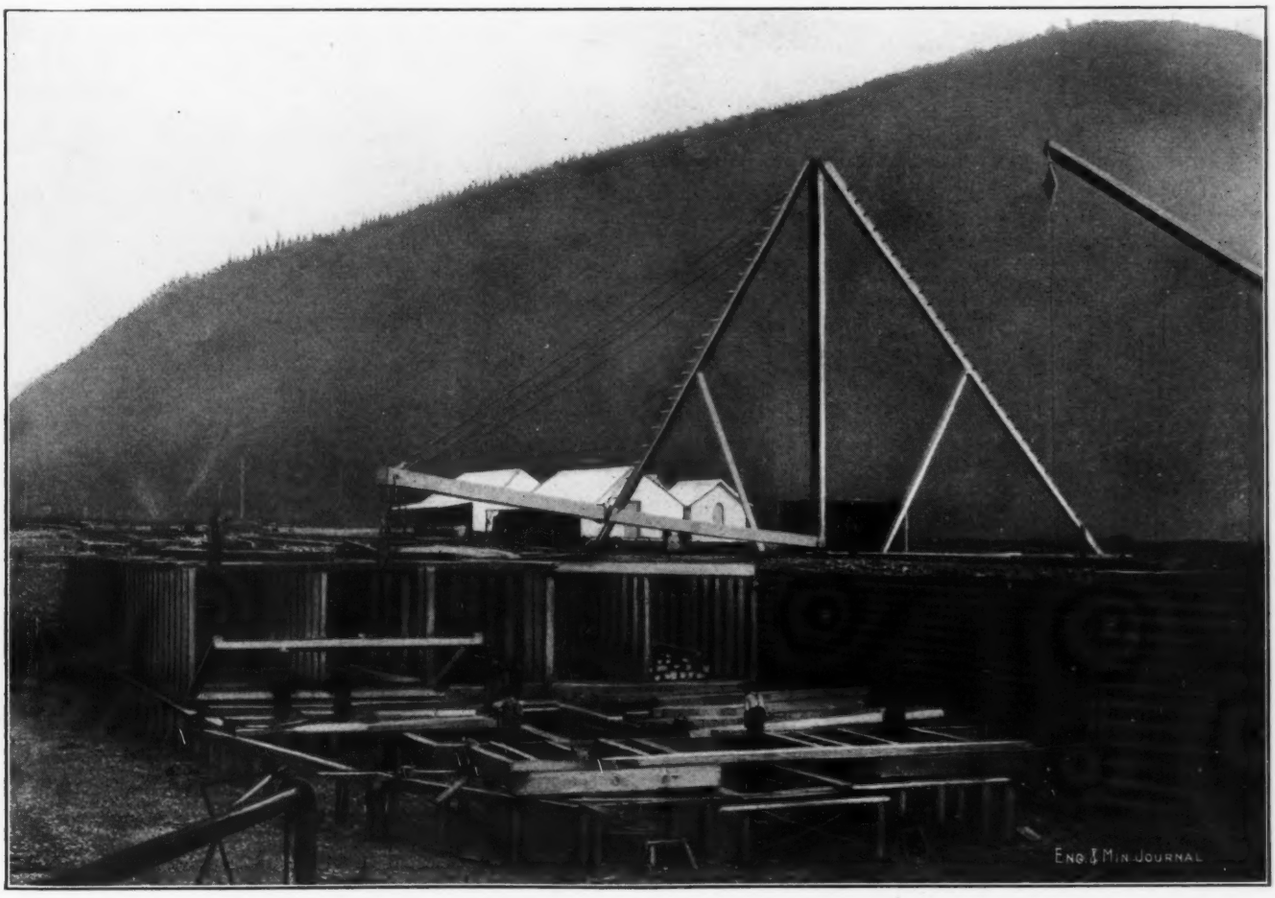
TRANSPORTING A LARGE TUMBLER (WEIGHT, 26,700 LB.) FOR ONE OF THE 16-CU.FT. DREDGES BEING BUILT NEAR DAWSON



BONANZA BASIN FROM THE PRECIPCE AT MOUTH OF KLONDIKE RIVER, LOOKING UP THE RIVER PAST THE MOUTH OF BONANZA CREEK TOWARD BEAR CREEK

The range on left forms the divide between Klondike and Twelve Mile Rivers. When the two 16-cu.ft. dredges of the Canadian Klondike Mining Co. are completed, they will be floated and dredge their way up the valley. The entire valley at this point is said to carry sufficient gold to pay for dredging.





DREDGES NOS. 3 AND 4 OF THE CANADIAN KLONDIKE MINING CO. UNDER CONSTRUCTION AT BONANZA BASIN IN AUGUST, 1912. THESE ARE TWO OF THE LARGEST DREDGES IN THE WORLD, HAVING 16-CU.FT. BUCKETS

Preliminary Testing of Placer Ground

SYNOPSIS—A combination Empire-and-Keystone drilling outfit is described by William F. Ward, who used the apparatus in the preliminary prospecting of Colombian placers. Some of the advantages of the equipment and the difficulties encountered in tropical work are enumerated.

The No. 3 steam-driven Keystone drill, using a 6-in. drive pipe, is the standard for drilling placer ground for the successful dredging companies in the United States, but for preliminary testing of new properties in out-of-the-way places, the hand drill with a 4-in. drive pipe is now being used with success, and the cost of such work is usually less than half that of the steam-driven drill. The latter method should permit the examination of many placers, which have heretofore been neglected on account of the prohibitory costs of the preliminary testing under former methods.

The hand drill most used in the field is the "Empire," made by the New York Engineering Co. I first used one of its drills four years ago in Colombia, but the ground was hard and deep, and the parts weak, so I experienced some difficulty. The "Empire" of today, however, is a stronger machine and many improvements have been made.

A Combination Empire and Keystone Rig

In my work in the tropics, I developed a system of hand drilling, using part Empire and part Keystone methods, which were especially successful. Its first cost is less, it has fewer parts, and I have had better success with it than with the regular outfit. A list and description of the apparatus used is as follows:

DRIVE PIPE. New York Engineering Co. make; in 5-ft. sections; outside diameter, 4½ in.; ends upset on inside allowing coarse threads, and flush joints on outside. The flush joints make pulling of the pipe possible by hand. (Outside sleeve joints would make hand pulling difficult.)

DRIVE SHOE. Plain; bevel on inside, New York Engineering Co. make.

DRIVING CAP. To protect threads of top pipe.

DRIVING RAM. Made of 3-in. diameter shafting, six feet long, with 4x14-in. driving clamps or blocks. Hole in upper end of shafting for hook on rope.

DRILL BIT. New York Engineering Co make; steel section, 1x3 in., and sharpened according to work required.

DRILL PUMP. This drill pump is a special feature of the Empire drill, made by the New York Engineering Co. It consists of a heavy pipe, outside diameter 3⅝ in., fitted with a nickel-steel hollow bit and ball valve. As the gravel is broken it enters the pump at once, thus drilling and pumping is accomplished at the same time.

VACUUM PUMP. Outside diameter about three inches, and made similar to the usual Keystone pump.

SINKER BAR AND JAR. Sinker bar, 3-in. shafting, five feet long. Jar, 1 ft. 6 in. long, with 6-in play. Top of jar has hole hook fastening, and bottom of sinker bar has a coupling to fit the conical coupling of the drill bit or drill pump.

HEMP ROPE. Diameter ¾-in.; length about 100 ft.

WINDLASS. Four-inch diameter, one handle with 16-in. arm; also fitted with small band brake.

OVERHEAD RIG. Four poles, each about 23 ft. long. with a 7-in. sheave. (The windlass is fastened to two of the poles.)

PULLING POLE. Generally about eight inches diameter and 25 ft. long. (This pole and the four overhead rig poles are cut on the ground or obtained locally.)

PULLING CAP.

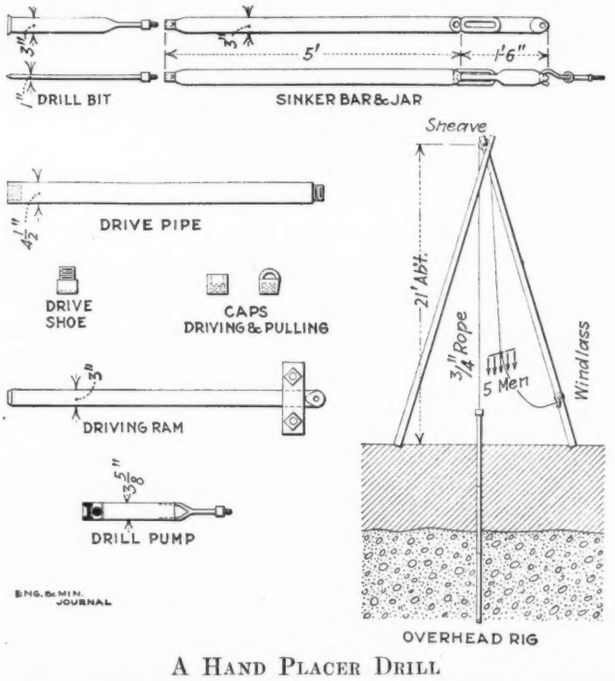
STRUCTURAL-IRON FULCRUM STAND. For pulling pole.

MISCELLANEOUS TOOLS. Chain tongs, wrenches, chains, carpenter and blacksmith tools, tubs, gold pans and trough.

EXTRA PARTS. Depending on distance from supplies and the amount of work to be undertaken. (Always an extra drive shoe, drill bit, and drill pump.)

Operating the Combination Rig

The method of operation for a normal hole is as follows: After the overhead rig is set up, the driving ram is raised by windlass to get the rig solid, and to locate the center of the hole. Then the driving ram is raised and two lengths of pipe (total, 10 ft.) with drive shoe and driving cap are set in place and driven in the soil to gravel, by the ram. The first blows are given by use of the band brake on the windlass, but after the pipe is started, the rope on the windlass is partly unwound, and a stout stick about the size of a shovel handle is fastened to the rope so that four to six men can take hold



A Hand Placer Drill

(The use of the sinker bar and rope, instead of steel rods, differs from the standard Empire method; the Empire platform, fastened to the driving cap, is not needed.)

to work. As the rope passes over the sheave in the top of the overhead rig, the men have to pull down in order to raise the driving ram; then by lifting the stick quickly the ram drops free; thus more than a 5-ft. drop is made possible.

The stick is slipped out of the rope, and the windlass used to lift the ram from the pipe and to lower to the ground. Then the rope hook is transferred to sinker bar and jar attached to the drill pump. It is raised by the windlass and lowered into the pipe. Water is added and the drill pump worked by means of the rope fastened to the stick as in driving, but not with such heavy blows. Here several changes of pumps may be necessary and an extra pump saves time, for while the first pump is being emptied and cleaned the other pump is put to work. The pumping is continued until a core of about one inch is left in the shoe of the pipe. The core is usually kept

Note—Excerpts from an article "Hand Drill for Economical Preliminary Testing of Placer Ground," in the Colorado School of Mines Magazine, March, 1913.

track of by marking on the rope the combined lengths of the driving cap, pipes and shoe. Thus one has only to note the distance of this mark on the rope above the driving cap. The pipe is marked on the outside, and in the field log the depth of drive pipe is also noted. As new pipe is added, the length of same is marked off on the rope. The pumpings from the soil are panned, but as a rule only a few light colors are found.

Not Desirable To Drive Pipe More Than Six Inches

When the work in the gravel begins, care must be used, especially if the gravel is rich. The pipe should be driven only six inches by driving ram. On account of the bevel of the shoe, the smaller diameter of the inside of the pipe, the core is usually seven or eight inches for this 6-in. drive. (Driving more than six inches with a 4-in. drive pipe is not desirable, for the core does not increase in proportion, which means that the gravel is stuck in the bottom of the pipe and crowded out.)

After the driving ram is removed, the drill pump on the sinker bar and jar is let down in the pipe, core noted in log, and combined drilling and pumping of the core of gravel is started. When about half of the core is drilled, pull up the drill pump with the windlass and put on the extra drill pump, letting it down with band brake, and drill until one-half inch to one inch of core remains. Note core in log and remove tools from the pipe and again drive six inches with the driving ram. Thus by alternate driving six inches, followed by drilling and pumping the core, the hole is put down to bedrock, and the gravel that properly belonged in the pipe is collected, its character noted, and gold content obtained, as well as the core noted for each particular depth of pipe.

The suction pump is generally used at the last cleaning out, and although the main working rope can be used, it is found to be more convenient to use a light rope and small overhead pulley, which is hung out of the way, but ready for instant use when needed.

Panning and Estimating the Gold

The material from the drill pumps is emptied into a small trough, leading into a gold pan set in the bottom of a tub. When one foot of material (that is, one foot of drive pipe) is collected, it is panned at once in the other tub, and the number and size of the gold colors noted in the log and saved.

When the hole is finished, both tubs are repanned, and total panmings put together and amalgamated with a few drops of mercury which is afterward parted with nitric acid and weighed, from which the value per cubic yard on the base of the outside diameter of pipe is calculated, and, if necessary, the value of each particular foot of depth can be pro-rated from the log. To be exact in figuring, the fineness of the gold must be known, but as most placer gold runs from 850 to 900 fine, 14c. per cu.yd. for every milligram per foot of depth, can be assumed for a 4½-in. outside-diameter pipe. Example: Gold, 40 mg. by weight, and total depth of hole 20 feet.

$$\textit{Cents per cubic yard} = \frac{mg. \times 14}{D} = \frac{40 \times 14}{20}$$

$$= 28, \textit{ i.e., } 28c. \textit{ per cubic yard}$$

Pulling the Pipe

The pulling of the pipe is accomplished as follows: Take off the driving cap and put on the pulling cap, and to this fasten the end of the pulling pole by means of a heavy chain, and place the structural-iron fulcrum stand close to the pipe. This work is made easy by first moving the overhead rig to a position so that the rope can be fastened near the center of gravity of the pulling pole, and using the windlass to handle same. The structural-iron stand has a line of holes and when the pole is raised, a steel pin 2 in. in diameter is slipped in at the proper place for the fulcrum. When all is ready, the men pull down on the pole gradually until everything is solid. Then the men mount or straddle the pole and spring up and down until the pipe moves, and the end of the pole touches the ground. The pole is raised again by windlass, the steel pin changed, and the process repeated until one section of pipe is up; then remove the section and continue as before. Of course, every hole is not put down and pulled as easily as the above; good judgment and experience often have to be exercised. I will mention some of the common troubles met with:

Troubles Commonly Experienced

A hard pebble larger than the pipe. In this case, the drive pipe refuses to go down, and the driving ram bounces like a small hammer upon an anvil. Drill and pump out core, being sure to keep plenty of water in the pipe, so that the sand and fine gravel will not run into bottom of pipe by reason of the unequal pressure of the ground water. Now put the drilling bit on the sinker bar and drill into the pebble, and even raise the whole string of tools 20 or 30 ft. and let drop, so as to break the pebble. If this is accomplished, then remove the drill, drive the pipe and go on as before.

If pebble proves to be a boulder, or a succession of large tight stones. If heavy blows by drill fail, sometimes it is advisable to raise drive pipe a foot or two and shoot with a half stick of dynamite. I have done this by using an ordinary fuse, but an electric-firing apparatus would be better, for then the hole could be pumped out and the charge placed directly upon the place to be broken, and when the drive pipe is raised, any caving will not hinder the operation. Of course, if the hole is shot, the few feet of material shaken and broken up must be kept separate from the rest of the gravel, and the value of this part can only be approximated by box measure. Sometimes it is policy to simply give up the hole and put another down near it.

A very hard pebble just large enough to enter pipe. The drill pump then fails to break the pebble and goes down pushing the core out, and brings up an empty pump. Use the sharpest drill bit until the pebble is broken up.

A streak of ground with water under pressure. Several feet of loose gravel and sand may run into the pipe and must be removed by the pump and kept separate. Often plenty of water in the pipe will prevent this from running in.

A layer of clay. This will sometimes cause trouble and loss of time by clogging up the drill pump. A special tool, which is really a split pipe, like a post-hole digger, will hasten matters.

The above troubles will not only occur with a hand drill, but also with steam-driven drills, and even with the latter at times a hole has to be abandoned before completion to bedrock.

A person soon becomes accustomed to the sound of drilling and the feel and action of the drill rope, so that

he can tell exactly what is happening below. In other words, careful watch must be continued all through the operation and everything noted in the log. Thus a record is obtained by which the value per cubic yard can be approximated close enough for practical purposes.

If a great deal of barren ground is to be drilled through, then the work can be hastened by driving more than six inches and also drilling and pumping below the shoe, but the latter practice must be stopped as soon as any gold colors are found in the pannings.

The pulling of the pipe has so far given me little trouble. I think it is mainly due to the kind of pipe used; that is, the smooth outside joint. Once, however, I was in tight, deep ground and the pipe got out of plumb. A heavy 30-ft. pole and eight men springing up and down on the end finally started the pipe.

My last work with this hand apparatus described, I did for the L. G. Pochet company, on the Nechi River, in Colombia, South America. Part of the work was in swampy ground, where no steam machine could have been taken without prohibitive expense. My whole apparatus and crew were moved in one large canoe, and drill parts often carried through mud and water knee-deep. The holes were from 20 to 40 ft. deep. I had a crew of eight natives; I did the panning myself and directed the work. Twenty-one feet per working day was averaged. The men were paid one dollar per day, and they boarded themselves. These native laborers were not as strong as the American workmen, but they did fair work, and certainly more than white men could do in the tropics.

Not far from this place in Colombia, S. A., there was a Keystone outfit sent from the United States, and although I have not the exact figures, it will serve to give at least a rough comparison. The amount of ground covered was about the same, with long moves and crossing of streams. Assuming both drilling parties to have started from New York, the cost for the hand drill was $2.70 per foot for about 1500 ft. of holes, and for the steam-driven drill about $7.50 per foot for about 1200 ft. of holes, the total expenses being about $4000 and $9000, respectively.

We all know that if the two machines were set up side by side, the Keystone steam drill would drill faster than the hand drill, but the difference in cost in preliminary placer testing comes in getting the machines to their respective holes. The Keystone in the above mentioned work lost out at first by taking eight days to unload from steamer and put together, against one day for the hand drill. For crossing rivers, time was lost in taking the machine apart to move in canoes and putting together again, as well as bad places to get over in the ordinary moves. More natives had to be hired to help, wood to be cut for fuel, and horses for packing water and wood. However, the native labor cost is a small item, for the main expense is the loss of time in traveling and moving machine, with the white men's expenses and salaries going on.

After a likely piece of ground is located by a preliminary examination, then for extensive drilling it is simply a matter of figuring as to whether the heavy steam machine or the lighter hand drill is better, for then the working conditions are absolutely known.

In conclusion I will say, that, having had experience with several kinds of drills, both steam and hand, and having seen their faults and advantages, I can certainly recommend the type of hand drill described to be the most economical for preliminary placer testing.

Sudbury Nickel Copper Deposits

The magmatic origin of the nickel-copper deposits of Sudbury is generally recognized. In the March *Bulletin* of the Canadian Mining Institute, Reginald E. Hore offers the suggestion that the differentiation of the ore from the country rock out of the same magma is one similar to that obtained in a blast furnace in separating the slag from the matte. Inasmuch as the conditions were not under expert control a very imperfect separation resulted, mineral being found present in the country rock and varying grades of ore being obtained. He states that the theory is largely substantiated by investigations made by David H. Browne, in a paper entitled "Segregation in Ores and Matte," published in the *School of Mines Quarterly*, July, 1895. Mr. Browne found that the analysis of a pot of nickel-copper matte showed a marked tendency of the nickel to accumulate in the center of the pot, well toward the bottom and that in the ore deposits a similar phenomenon existed, the ratio of nickel to copper increasing toward the middle of the orebody and also increasing with depth. This may be expressed by saying that the copper tended to concentrate at the boundary of the deposit. Furthermore, analyses of slag and matte showed the ratio of nickel to copper to be greater in matte than in the slag, and the same relation holds true for ore and the rock that is mined in conjunction with the ore. Secondary deposition and alteration has, of course, taken place, but the primary localization of the orebody is unquestionably due to a differentiation of the silicate and the sulphide elements in an original magma.

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Salt Creek Oil Field, Wyoming

The Salt Creek oil field is in Natrona County, central Wyoming, about 45 miles north of Casper. A commercial and geological description of the district is given by T. E. Jamison, state geologist of Wyoming, in *Bull.* 4, Series B. Of the different fields in the district, the greatest development has taken place in the Salt Creek dome and Shannon fields; while the Dugout Creek district and the Bothwell syncline are comparatively unexplored; the Teapot dome is withdrawn from entry. There are about 12 companies operating in the district. In the Shannon district 40 wells have been driven, three of which are dry; four produce water only, and 33 produce oil. In the Salt Creek dome, 81 wells have been driven, the production per well varying from a few barrels to as much as 2000 bbl. per day. Several formations carrying oil are known, but the most productive are the Wall Creek sandstone and the Shannon sandstone. The total production of the Salt Creek district to date is estimated at about 2,500,000 bbl. The average daily production is only 7500 bbl. on account of a lack of refinery capacity, although the wells are capable of producing 12,000 bbl. The oil is transported through the pipelines of the Midwest Oil Co. and the Natrona Pipeline & Refinery Co. to their refineries in Casper.

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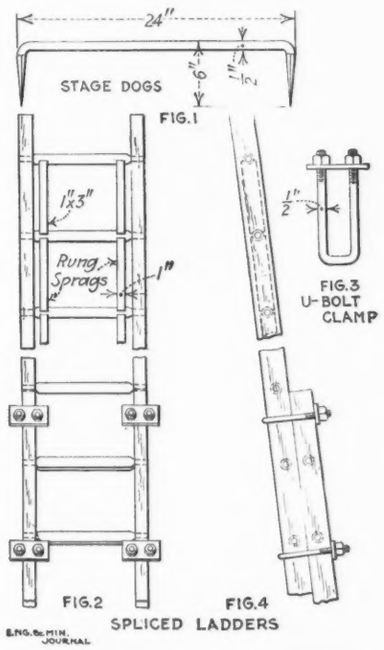
The Smallest Dynamo in the World is said to be the one now in exhibition in France, writes a New England engineer, a contributor to "Power." It is smaller than an American penny in diameter and weighs only one-fifth of an ounce, is 6 mm. high, and used as a generator as well as a motor. It consumes 2 amp. at a pressure of 25 volts. The curious part of the whole thing is that it is accurately made, and can be operated by a small pocket battery.

DETAILS OF PRACTICAL MINING

Building High Stages with Ladders

Where the walls of underground workings are strong enough so that they can be left open for long periods of time, the back is apt to become bad and slab off; this is true even where careful trimming has been done before the ore was worked out. It then becomes necessary to erect stages and bar or blast down the bad ground. In the JOURNAL of Oct. 5, 1912, the methods of trimming high backs used in the mines of southeastern Missouri were described. But usually where there is not much trimming, the back can be reached more easily by means of stages built up with ladders as legs.



DEVICES APPLIED TO LADDERS USED FOR STAGING

This is the method used in Michigan at the hard-ore iron mines and at those copper mines where the lodes dip steeply. In order to get the most stable stage, one or two ladders should lean against one wall; but a satisfactory substitute consists of standing three, four or even six ladders vertically on an even base of ore and building a pile of boulders two or three feet high around the bottoms of the ladders. By wedging the main stage planks between the legs of the ladders the whole is tightly tied together.

Instead of wedges for binding the ladders to the main or strap planks that carry the planks of the working platform, timber dogs are used at the mines of the Cleveland-Cliffs Iron Co. These are made of ½-in. iron of the form and dimensions shown in Fig. 1. The advantage of these over nails is that they tie the planks together more securely and also can be taken out more easily by means of a pick or bar.

In order to distribute the strain over several rungs, pieces of 1x3-in. plank with a notch at each end, cut just long enough to fit snug, are driven in next to each leg between several sets of rungs, as shown in Fig. 2. In this way danger from the rungs of the ladders giving away under the weight of the stage is minimized.

Often a stage has to be built to reach a back 30 ft. high or more. As mine ladders are rarely over 16 ft. long, it then becomes necessary to splice them together. Side cleats can be nailed to the legs for this purpose, but a much more secure and handy method is by the use of U-bolts, shown in Fig. 3. Fig. 4 readily explains the method of applying these. The bolt is made of ½-in. iron with a plate or double washer of ½x1½-in. iron.

Breaking Strength of Timber

In the design of frame structures it is often difficult to get figures of breaking strength for timber that is now actually used, such as yellow pine and Douglas fir; white pine and oak are almost obsolete for heavy construction,

COMPARATIVE STRENGTHS OF DIFFERENT WOODS, DRY AND GREEN

	Bending			Compression parallel to grain			Compression perpendicular to grain
Species	Modulus of rupture, lb. per sq.in.	Modulus of elasticity, 1000 lb. per sq.in.	Horizontal shear, lb. per sq.in.(a)	Crushing strength at elastic limit, lb. per sq.in.	Crushing strength at maximum load, lb. per sq.in.	Modulus of elasticity, 1000 lb., lb. per sq.in.	Crushing strength at elastic limit, lb. per sq.in.
Longleaf pine:							
Green	6140	1463	353	3480	4800	....	568
Dry	5749	1705	272	3480	4800	....	572
Douglas fir:							
Green	5983	1517	166	2770	3495	1414	570
Dry	6372	1549	221	3271	4258	1038	639
Shortleaf pine:							
Green	5548	1473	332	2460	3435	1548	351
Dry	6573	1726	364	4070	6030	1951	796
Western larch:							
Green	4948	1301	288	2675	3510	1575	456
Dry	5856	1487	340	....	5746	....	597
Loblolly pine:							
Green	5084	1387	335	2050	2940	548	500
Dry	6118	1487	434	3011	4292	1206	655
Tamarack:							
Green	4556	1220	261	2400	3230	1373	....
Dry	5498	1341	299	3349	4320	1351	....
Western hemlock:							
Green	5296	1445	288	2905	3355	1617	434
Dry	6420	1737	307	4840	5814	2140	473
Redwood:							
Green	4472	1042	302	3194	3882	1240	434
Dry	3891	890	....	....	4276	....	525
Norway pine:							
Green	3864	1133	232	2065	2555	1002	....
Dry	6054	1418	278	3047	4228	1367	....

(a) Only those timbers are included in this average which failed first in horizontal shear.

due to their scarcity and high cost. The U. S. Forest Service, in *Bull.* 108, publishes the result of a series of tests on various species of timber, made on both small and large sections. The accompanying table summarizes the result for the large sections on both dry and green material. The tests were made on timbers ranging in cross-section from 4x10 to 8x16in., with bending tests taken on a 15-ft. span. Small and ordinary defects were

present in the material so that the results are a fair average of what can be expected of such timber as purchased. However, in a non-homogeneous material like wood, an average result is not altogether trustworthy and great variation from such a figure is invariably found in both directions. It is therefore necessary to allow a large factor of safety in designing wood structures. The column headed "horizontal shear," is more clearly described as splitting with the grain. It will be noted that in general there is an increase in strength of all kinds, got by seasoning the material. However, if seasoned material is again wet to a degree of dampness equal to its green condition, it is as weak as before seasoning. The varieties, long-leaf pine, short-leaf pine and loblolly pine, comprise what is known as southern yellow pine.

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Muck Thawing by Solar Heat

The overwhelming problem in the Yukon district is the thawing of the overlying muck and gravel on the gold-bearing ground. Various methods have been tried; steam points are generally used; solar heat combined with removal of material is sometimes attempted; hot water has been used similarly to steam; and electrical thawing is proposed. In making an examination of the problem, says Henry Mace Payne, in a paper read before the Ottawa meeting of the Canadian Mining Institute, it was found that no accurate data could be had on the temperatures and other features of the frozen ground or on the rate of thawing by natural or solar heat. To ascertain some of these facts, an extensive study of this subject was made by me, with the assistance of W. L. Churchill, during the summer of 1912 in the interest of the Yukon Gold Company.

Holes were drilled in the frozen ground with 1¼-in. steel bars. Thermometers, carefully calibrated, and inclosed in thin metal pipes with brass screw plugs on the end, were lowered into the holes and the tops of the holes plugged with moss. The result of 27 tests gave a bedrock temperature varying from 2° F. to 14°, a temperature of the gravel varying from 17° to 22°, of the black muck from 17° to 24° and of the sandy muck from 19° to 24°. These results, charted, showed that after reaching the frost line the temperature dropped within the next few inches to the mean temperature of the mass, even when there was little or no muck covering, and also that the temperature was dependent solely on the nature of the material and not on the depth of material, the depth of the frost line or on the water level.

Following this, an investigation was made of the physical properties of the frozen mass and 46 samples were taken of black and sandy muck, gravel, sand and bedrock, from all over the district. The results of the test are briefly summarized in the accompanying table.

A further investigation was also made with the apparatus shown in the illustrations, Figs. 1, 2 and 3, in order to determine the rate of natural or climatic thawing in terms of thermal units. The apparatus consisted of a sheet-iron tank, riveted and soldered and painted black on the inside, 3 ft. 6 in. in diameter and 4 ft. high. It was surrounded on the sides and bottom with a 2-in. layer of asbestos, reinforced in the center with fine wire and covered with brattice cloth. It was insulated from the earth by a 2-in. plank platform, made of the end of a cable reel. On the inside bottom of the tank was a four-legged bench, as seen in Fig. 1, 17 in. high and 20x24 in. square on top. Upon this rested a rectangular wood casing of the same lateral dimensions and 31 in. high. The outside of this casing also was protected by a 2-in. asbestos layer. Inside the casing was about ¼-in.

PHYSICAL PROPERTIES OF FROZEN MATERIAL

Material		Black and Sandy Muck	Gravel and Sand	Bed-rock
Average specific gravity of material, frozen		1.401	2.189	2.590
Average specific gravity of material, thawed and dry		2.411	2.691	2.655
Average specific heat, frozen material		0.196	0.172	0.183
Average percentage of ice in frozen material	By volume	68.2	29.1	9.6
	By weight	44.7	16.0	4.26
Average percentage of solids in frozen material	By volume	31.8	70.9	90.4
	By weight	55.3	84.0	95.74
Average percentage of voids by volume in frozen material		0.0	1.28	0.0
Average percentage of voids by volume in thawed material		6.1	3.97	1.65
Average percentage of ice per cubic foot of frozen material		39.11	22.00	6.96
Average pounds of solids per cubic foot of frozen material		48.39	115.50	154.95

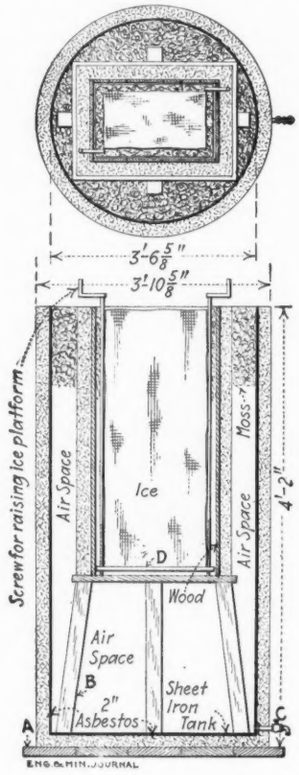

FIG. 1. APPARATUS FOR MEASURING THAWING RATE OF ICE

clearance on each side was a wooden, false-bottom; through two metal plates at the diagonally opposite corners of this were screwed ½-in. rods, threaded their entire length and resting upon metal bearing plates 2 in. square on the corners of the bench. These rods were actuated by removable socket-wrench handles at their upper extremities.

Ice was selected as the medium for measurement of the rate of thawing. In the bottom of the tank was inserted a faucet to draw off accumulated water, both to check the rate of melting and to allow for rainfall by deducting it, if any such occurred. To insert the ice the false bottom mentioned is screwed to the top and the cake of ice put upon it and lowered into the casing, until its top is just level with the top of the casing. The upper half of the air space between the casing and the tank is loosely

packed with moss and any irregularities around the sides of the ice cake are filled with the same material, so that the only uninsulated portion of the ice exposed to climatic action is the level surface at the top. In order to duplicate the conditions found in nature, approximately 50% of the surface of the ice is sprinkled with fine black muck, inasmuch as the frozen muck in place is about 50% ice. The rate of melting is recorded at regular intervals and the ice cake raised by means of the screws to a position level with the top of the casing. From the quantity of ice which disappears, checked by the amount of water formed below, can be calculated the heat units furnished by sun and air; and as conditions duplicate those found in nature as closely as possible, the total units required to melt one cubic foot of ice, 50%

FIG. 2. GENERAL VIEW OF APPARATUS, SHOWING SCREW HANDLES AND FAUCET

FIG. 3. TOP OF THAWING DEVICE, SHOWING ICE, PACKING AND SCREW HANDLES

covered with fine muck, should approximate the units required to thaw one cubic foot of average muck, as ascertained from the table. There can also be ascertained the approximate average amount of heat per hour or per 24 hours, which can be expected throughout the open season.

During the early spring and late fall a supplementary record must be kept of the amount of freezing at night. For this purpose a large gutta-percha developing tray, about two inches deep, is placed on a bed of moss, with moss on the sides and set in a shallow box level with the top. This tray is kept filled with water and the ice formed each night is deducted from the total thawing of the tank on the preceding day. During the last season the average net meltage of ice per 24 hr. was 1.191 in., equivalent to 3¼ in. of frozen muck, supposing the melted muck to be removed as quickly as thawed.

Bending Stresses in Hoisting Rope

The safety factor of a hoisting rope is usually based on dead loads only and is made large to include unknown stresses. The two most important of these are bending stresses on the sheave and drum and shock due to starting with slack rope or to similar causes. Bending stresses can be calculated and should be included in the known stresses, the safety factor in that case being reduced, but stresses due to shock must be covered by the safety factor, as they cannot be easily ascertained. The modulus of elasticity of a wire rope is much lower than that of the individual wires, of which it is constructed, says A. W. Brown, in Appendix V, of a paper entitled "Electrically Driven Winding Engines in South Africa," (*Trans.*, North Eng. Inst. of Min. and Mech. Eng., Vol. LXIII, Part 1). The stretching which takes place when a new rope is loaded is due largely to the tightening down of the wires and the bedding of the strands into the hempen core. A settled condition is soon attained where 11,180,000 is a good average figure for the modulus of elasticity of the entire rope. In old rope the wires take a permanent set, reducing the amount of tightening in the cores to a minimum and the modulus of elasticity is increased to about 19,000,000. Further calculations in this article are based upon these figures.

BENDING STRESSES IN POUNDS PER SQUARE INCH, CALCULATED FROM FORMULA

Ratio of Pulley Diameter to Rope Diameter	Type of Construction: 6 Strands, 7 Wires per Strand		6 Strands, 19 Wires per Strand		6 Strands, 37 Wires per Strand	
	New	Old	New	Old	New	Old
20	66,800	107,500	38,600	61,800	27,200	43,500
30	44,500	71,600	25,700	41,000	18,100	29,000
40	33,400	53,700	19,300	30,900	13,600	21,800
50	26,700	43,000	15,400	24,600	10,850	17,400
60	22,500	35,900	12,850	20,600	9,050	14,500
70	19,100	30,800	11,000	17,600	7,780	12,450
80	16,700	26,900	9,650	15,400	6,800	10,900
90	14,800	23,800	8,550	13,700	6,030	9,650
100	13,350	21,500	7,700	12,300	5,440	8,700
110	12,100	19,500	7,000	11,200	4,930	7,900
120	11,100	17,900	6,400	10,250	4,520	7,240
130	10,250	16,500	5,900	9,450	4,180	6,700
140	9,550	15,400	5,500	8,800	3,890	6,230
150	8,900	14,350	5,140	8,225	3,620	5,800

In formula $S = F \delta \div D$,
For ropes of 6 strands, 7 wires each, $\delta = 0.113$ diam. of rope.
For ropes of 6 strands, 19 wires each $\delta = 0.653$ diam. of rope.
For ropes of 6 strands, 37 wires each, $\delta = 0.046$ diam. of rope.

For a rope bent around a drum or sheave, bending stresses can be expressed thus:

$$\textit{Pounds per square inch} = E \times \frac{\delta}{D}$$

Where

E = Modulus of elasticity of rope;
δ = Diameter of largest wire in inches;
D = Diameter in inches of the smallest pulley around which rope passes.

Thus the bending stress increases as the diameter of the sheave decreases, and in a rope with a given safety factor the bending stress forms a greater proportion of the total load on a small pulley than on a large. For example, a rope which is one inch in diameter, of 100-ton steel with a safety factor of six, will bear a total working load of 13,800 lb. If constructed of six strands of seven wires per strand, then on a pulley, 60 in. in diameter, the bending stress is about 8250 lb., leaving 5550 lb. for working load. After service, near the end of its life, the bending stress is increased as the modulus of elasticity increases, and reaches, perhaps, 13,200 lb. Thus, if the same load is still hoisted, without even making an allowance for wear, the safety factor is reduced from 6 to 4.4,

and if it be desired to maintain the original safety factor, the rope capacity has been reduced 89.2%. But if the pulley diameter is 100 in., the bending stress becomes 4950 lb. when new, and 8000 lb. when old, leaving a working load of 8850 lb. and a final safety factor, again neglecting wear, of 4.9. Or, the rope capacity is reduced only 34% if the original safety factor is maintained. The table gives the bending stresses in three different types of rope, both new and old, for various pulley ratios, and also a ratio between the value of delta and the diameter of different types of rope.

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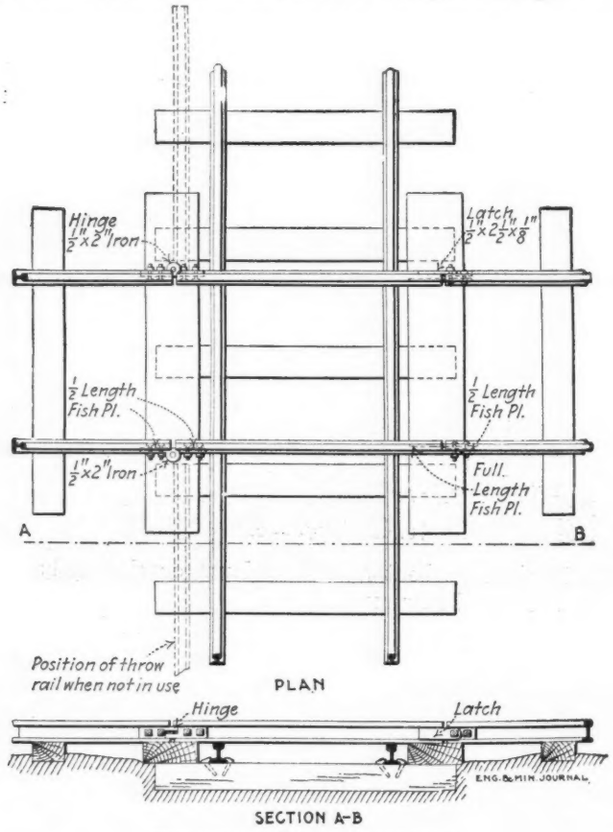
Temporary Crossover

In surface or underground work, conditions may exist where two tracks cross, without there being any necessity for switching from one to the other. If traffic is light or only temporary on one track, it is often advisable to provide it with a movable crossover, leaving the other track unbroken. In such case it is brought through at a slightly higher level so that its rails rest on the tops of the permanent rails. These rails at the crossing are hinged at one end and latched at the other and can be swung out when not in use, thus leaving the lower track unblocked. The construction of the hinges is shown in the drawing. They are held out by half lengths of fish-plates used as fillers, and are themselves of ½x2-in. iron. The latches are also held out from the fixed rails by fillers and are of sufficient width to bear on the head of the rail. They are of ½x2½x8-in. iron. The inside of each fixed rail is provided with a full-length fish-plate, which holds the movable rail in its proper position when in use.



SWINGING RAIL CROSSOVER

Safety of Extremely Strong Hoisting Ropes

A discussion of data obtained in the experiments of Speer is presented by D. F. Baumann (*Glückauf*, Jan. 25, 1913; abst. *Journ.*, American Soc. Mech. Eng., Mar., 1913). A doubt has been expressed as to the ability of ropes made of extremely high-tensile-strength steel to resist fracture in bending. Mr. Baumann concludes that the number of safe bendings in a rope increases with the increase of the breaking strength of its wires and that the deleterious effect of high tensile strength on its resistance to bending strain does not exist. The belief that the number of possible bendings increases rapidly with the increase in radius of the sheave or drum and decreases slowly with the increase of load is confirmed. The selection of high-tensile-strength ropes for great depth and large loads is therefore recommended and the use of larger pulleys for such rope is found to be not absolutely necessary.

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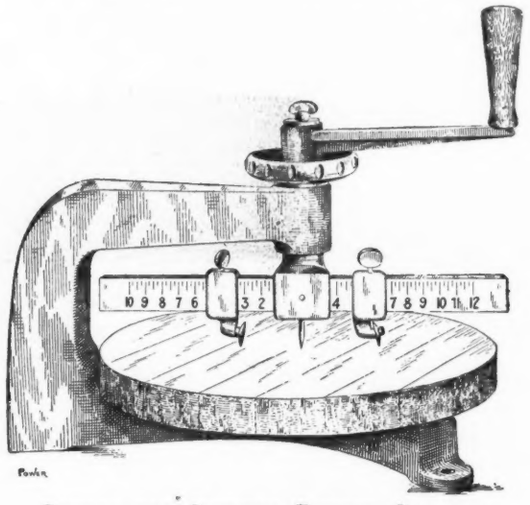
Stewart Gasket Cutter

The accompanying illustration shows a gasket cutter for cutting sheet asbestos, fiber cloth, wire insertion, copper, lead or other metallic packings to any size from 1½ in. up to 12 in. in diameter (*Power*, Feb. 18, 1913). The frame is cast iron, and has a hard maple table secured to it by screws. The crank has a square opening which fits over the vertical spindle with a ½-in. space between the top of the spindle and the top of the crank, to allow for adjusting the thumb feed-regulator screw.



DEVICE FOR CUTTING RUBBER GASKETS

The force-feed handwheel may be used on soft packings for feeding the cutters downward. The carrier bar is graduated in inches, and any required size of gasket can be obtained by adjusting the cutters to the scale. The cutters are tool steel, and are dished on the inner side, concave on the outer and set at a slight angle.

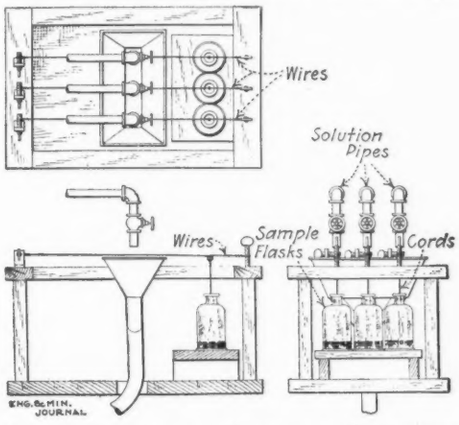
In cutting fiber or other hard material the thumb-screw may be adjusted by a quarter turn so that the feed is automatically regulated. The carrier bar moves down from ⅛ to ½ turn per revolution, as desired. This machine is made by L. R. Stewart, 70 East Thirty-first St., Chicago, Ill.

DETAILS OF METALLURGICAL PRACTICE

Wire Sampler for Cyanide Solution

By H. P. Flint*

An ingenious and cheap device has been in use over a year in an Arizona cyanide plant for automatically sampling solutions. The general arrangement is shown in the drawing. Three grades of solution are brought to the sampler in ½-in. pipes, and the stream from each pipe is cut by a piece of baling wire attached to thumbscrews at each end for adjusting its horizontal position in the stream and its inclination. A small quantity of solution flows down the wire and is intercepted by a



Simple Device for Sampling Solutions

knot and directed down a cord into the bottles in which the sample is collected. The cord is weighted at its lower end. The reject is caught in a hopper and conducted to a lower tank. The pipes have valves set in the vertical nipples to control the flow of solution.

Zinc-Dust Precipitation at Brakpan Mill

The precipitation equipment at the Brakpan Mines plant, on the Rand, consists of three Merrill presses with belt feeders. Trouble was experienced at first (*Bull.* 101, I. M. M.) in obtaining a regular feed of zinc dust, owing to the poorly constructed feeding mechanism. This difficulty was eventually overcome and the belt system formed a satisfactory feeder. It was also found necessary to supply the presses with exceedingly clear solution. Slightly turbid solutions that would not have any effect on the precipitation in zinc boxes, caused the cloths to choke, and caused a rapid rise in pressure in the press, necessitating bypassing and resting of the press. It was also found advantageous to keep the cyanide strength higher than would be the case with zinc boxes.

In spite of the troubles that were experienced at first, it came to be admitted that the presses possessed several advantages when compared with the zinc-shaving system. Less time and labor were spent on the cleanup. There was no gold left in the plant after the cleanup. The space occupied by the plant is smaller than that occupied by zinc boxes. The richer gold slime left after acid treatment and calcining resulted in decreased time and expense in smelting. There were fewer samples to be assayed, and, finally, the gold in the press was safe from theft. There still exists the variability in the nature of the zinc dust supplied; some consignments being much more efficient than others.

*Goldroad, Ariz.

Cheap System of Cleaning Oil

The bearings of the jaw crushers used by the Desloge Consolidated Lead Co. are lubricated by oil fed from drip cups continuously; while water is constantly run on the pitmans for cooling. It is necessary to feed an oversupply of oil in order to flush the dirt from the bearings. The oil and water are drawn off together and to recover the oil, a rough separation is made in a series of three

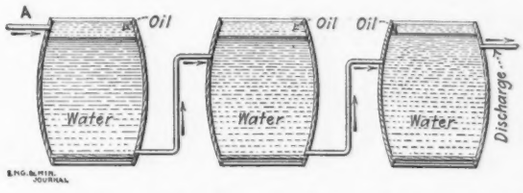


Fig. 1. Cleaning Barrels for Dirty Lubricating Oil

50-gal. oil barrels set in the ground as shown in Fig. 1. The mixture flows in through the pipe *A* and about 90% of the oil gathers on top, while the grit settles out. The water is drawn off from near the bottom and piped into the next barrel about three inches below the level of the water standing there. An additional 8% of the oil rises here. Similarly about 2% is caught in the last barrel and very little finally flows off with the water.

After this process, the oil is carried to a filter to remove what dirt remains. The filter, shown in Fig. 2, consists of a 60-gal. steel oil-tank *B* set in a rectangular containing tank of concrete *C*, and itself containing a smaller receptacle *D*, the filter proper, made of No. 14 iron. Steam is fed through the pipe *E* into the space *F*, between the tank and the concrete container. A petcock *M* is provided to discharge condensed steam. The tank rests on blocks *S*, about six inches up from the bottom of the container so that the steam can get on all sides of it. A ring of concrete *G* covers the top of the space *F* and the tank has a cover *H*, made of tin.

The filter proper has a flaring collar *I* which fits over the edge of the tank. A 12-mesh screen *J*, in this collar, retains the coarsest of the foreign particles still in the oil. Through this the oil drips down to two diaphragms *K* of 1-mm. screen on which are several layers of burlap. After filtering through the burlap, the oil is discharged through the pipe *L*. The lower part of the tank is filled with water heated by the steam. This increases the fluid-

ity of the oil so that it rises through the water in small globules and is thoroughly washed. As the oil accumulates on the water, it flows out through a drain pipe *N*. This is about three inches higher than the overflow pipe *O*, which takes off the surplus water. An additional discharge *R* serves to remove the precipitated sludge.

The manner of attaching the discharge pipe *L* to the bottom of the filter proper is interesting. It is simply a 1-in. pipe, threaded at its end. A nut *P* is put on the pipe, the pipe is put through the hole, another nut *Q* put on the end and both nuts screwed down, locking the pipe so securely and tightly that there can be no leak. Fig. 2 gives the approximate dimensions of the filter.

The oil is quite free of sediment and good enough for

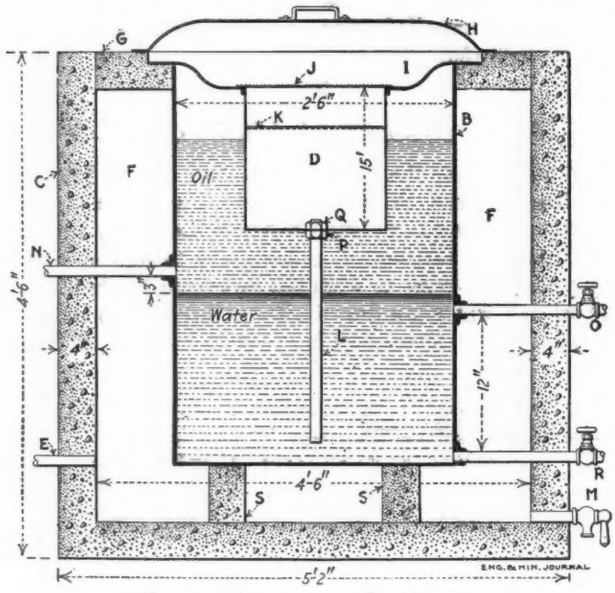


FIG. 2. HOME-MADE OIL FILTER

use in the air drills underground and on the mine cars. The cost of recovering and cleaning is slight, and there is only a small loss, which occurs in taking the oil from the barrels to the filter. About 20 gal. can be cleaned in 24 hr. The system was devised by the mine captain, Thomas Fisher.

Dust Chamber Velocities

Discussing flue-dust losses at the March meeting of the Institution of Mining and Metallurgy, Lewis T. Wright said that from the top of the short stacks used 20 years ago there might have been a loss of 10% in flue dust. Many years ago he had made some experiments, and found that an air velocity of 16 ft. per sec. would freely carry coarse flue dust from rest, and a velocity of a little less than 10 ft. per sec. would hardly move it at all. He thought at that time a velocity of 5 ft. per sec. was a tolerably safe velocity in the dust-collecting flues. He commented on the fact that Doctor Douglas, in his paper on the Copper Queen mines, had spoken of a velocity of 150 ft. per min. (2½ ft. per sec.), which had been found at Douglas to be sufficiently low to settle very fine flue dust in comparatively short distances. He inferred that in the new plant Doctor Douglas' company had adopted a velocity of 5 ft. per sec. because reference was made by Doctor Douglas to the wire screens giving equally good results at twice the previously mentioned velocity. It was considered that at this velocity practically all the dust discharged from the furnaces would settle out if given an opportunity.

Mr. Wright recalled the school experiments of the large glass globe with two small inlets. Through that glass globe was blown smoke which, instead of diffusing itself throughout the globe, took a straight course from the inlet to the outlet on the other side; that was to say, the gas or air had ineria. Therefore, in introducing air into the large chamber for the purpose of diminishing its velocity, it had to be given an opportunity of extending itself through the whole section of the chamber, and he did not think that was always done. Such precaution, however, had been taken in the case which he cited where a velocity of 5 ft. per sec. had proved practicable. In some cases where the gases carried away metals more valuable than copper, he thought that a velocity of 1 ft. per sec. would be the least that could be adopted.

Notes on Oil Burning

Whenever oil is burned in the liquid state or in conjunction with coal, smoke is sure to form, especially when the furnaces are being heated up or steam is first being generated. When oil is burned in the gaseous form, smoke is less likely, but even then some will form if the men attending the furnaces are not accustomed to burning oil, or if the burners are poorly proportioned or designed, says William Kavanah (*Power*, Dec. 31, 1913). Compressed air, if available, may be used as an initial means of smoke prevention, but neither air nor steam will stop smoke forming if the oil is improperly handled or fed to the oil burners.

Two kinds of oil are in general use for steam generation. One known as "fuel oil," and the other as "crude oil." Fuel oil is a product of the oil refinery while crude oil is taken direct from the wells. The calorific values of the two oils do not vary much, but crude oil has the higher. The difference in favor of crude oil can be easily lost if it is poorly handled. It will take in round numbers 185 gal. of fuel oil to equal one ton of coal of good quality, allowing 7.5 lb. to the gallon and 20,000 B.t.u. per pound. One ton of good coal will contain 28,000,000 B.t.u. and dividing this by the heating value of one gallon of oil gives about 187 gal. as the result.

A disadvantage of oil is the rapid formation and deposition of carbon on the heating surfaces of the boiler which retards heat transmission. Coal also will deposit ash or carbon on the boiler surfaces, but this deposition is slow when compared with that of carbon from improper oil burning.

Substitute for a Porcelain Spot Plate

A neat substitute for the porcelain spot plate, especially for assayers in the field, where the object is to dispense with all breakables, is found in the sheets of oiled paper prepared by the Mine & Smelter Supply Co. These sheets are practically impervious to chemicals, and the indicator drops will assume a spherical form on its surface. The drops do not run together unless it is desired, when they can be brought together with a stirring rod. The same sheet can be used repeatedly by shaking off the drops, or each sheet can be destroyed after being used once.

THE COST OF DOING THINGS

Cost of the Rawley Tunnel, Colorado

There is given in Table I, a summary of the total expense incurred in driving the 6235-ft. adit of the Rawley Mining Co., in the Kerber Creek district, of Colorado,

TABLE I—DISTRIBUTION OF DRIFTING COSTS

	Total Cost		Cost per Foot	
Underground				
Drilling and firing				
Labor	$17,604.17		$2.822	
Powder and fuse	12,506.15		2.006	
Supplies and repairs	2,641.33		0.424	
Total		$32,751.65		$5.252
Mucking				
Labor	13,317.22		2.134	
Supplies	142.09		0.023	
Total		13,459.31		2.157
Tramming				
Labor	6,277.41		1.007	
Supplies	764.94		0.122	
Total		7,042.35		1.129
Track and pipe				
Labor	2,740.95		0.440	
Supplies	19.21		0.003	
Total		2,760.16		0.443
Timbering				
Labor	5,418.33		0.869	
Supplies	1,955.38		0.313	
Total		7,373.71		1.182
General				
Labor	7,277.38		1.168	
Supplies	1,717.24		0.275	
Total		8,994.62		1.443
Surface				
Power plant				
Labor	6,648.67		1.066	
Supplies	1,099.83		0.176	
Fuel	8,201.79		1.316	
Total		15,950.29		2.558
Blacksmithing				
Labor	3,733.83		0.599	
Supplies	811.00		0.130	
Total		4,544.83		0.729
General				
Labor	4,199.92		0.674	
Supplies	1,000.34		0.160	
Total		5,200.26		0.834
General				
Salaries	8,250.00		1.323	
Supplies, phone, etc.	4,100.27		0.658	
Total		12,350.27		1.98
Freight and haulage not otherwise distributed	18.83	18.83	0.003	0.003
Permanent plant				
Labor	2,550.96		0.409	
Supplies	17,645.24		2.830	
Total		20,196.20		3.239
Boarding house				
Labor	2,512.73		0.403	
Supplies	8,752.71		1.403	
Total	11,265.44		1.806	
Credits	11,042.51		—1.770	
Loss		222.93		0.036
Total footage	6235.50			
Total costs		130,865.41		20.986
Deduction for salvage on permanent plant		6,925.87		1.111
Net costs		123,939.54		19.875

as presented by Messrs. Simonds and Burns before the February meeting of the American Institute of Mining Engineers. The nature of the work and the general conditions governing its prosecution were adequately described by Will. C. Russell, in the JOURNAL for Feb. 1, under the title, "Driving a Long Adit at Bonanza, Colorado."

TABLE II—PERMANENT PLANT ITEMS SALVAGED AT 50% OF VALUE SHOWN

Drills and fixtures	$647.01
Drill sharpener and fixtures	1,031.17
Engine and blower	800.46
Air pipe for blower and fixtures	3,254.04
Compressor air pipe	1,543.91
Drill steel	916.48
Steel rails, bolts and spikes	1,849.78
Tram cars	2,576.69
Mules and harness	756.24
Steel plate for muck	84.44
Water pipe	391.52
Total	$13,851.74

Table II is a list of some of the items in the permanent plant which were assumed to have still some appreciable value and which were credited to the work at 50% of their cost, or $6925, equivalent to $1.111 per ft. The cost of the work, estimated in advance, was $21.12. The cost attained was $19.875. Considering the impossibility of ascertaining in advance the quality of the rock to be penetrated, the amount of water and the amount of timbering, this is hitting it pretty close. It should also be stated that there was a saving made of about 25% on the lowest responsible bid submitted for contract work.

Montana-Tonopah Costs

As stated in the annual report for the year ended Aug. 31, 1912, the Montana-Tonopah Co., of Tonopah, Nev., mined and treated 53,874 tons of ore, having an average value of $15.341 per ton. The loss in tailings amounted to $1.533 per ton, leaving $13.808 per ton recovery. The total value of the ore amounted to $826,524 and the loss in tailings to $82,663. The direct cost of operation was $8.771 a ton and indirect cost $0.548, a total of $9.319 a ton. Earnings from miscellaneous sources were $0.665 a ton, giving a profit of $5.154 per ton of ore. Depreciation was charged off at the rate of $1.175 a ton, leaving a net profit from operations of $3.979 a ton. The direct costs were made up as follows: Mining, $2.976 per ton; development, $1.350; diamond drilling, $0.077; milling, $2.96; general expenses, $0.431; maintenance, $0.201, and marketing product, $0.776 per ton. The mining cost was made up of 73.5% labor and 26.5% for supplies. Development work consisted of 71.6% for labor charges and 28.4% for supplies. The principal labor items in mining costs were: Ore breaking, 57.9c.; hoisting and dumping, 19.7c.; shoveling and sorting, 67.5c.; tramming, 22.4c.; timbering, 20.9c.; foreman and superintendence, 12.4c. per ton mined. Supplies for breaking ore amounted to 29.2c.; compressed air, 11.1c.; hoisting and dumping, 5.9c.; hoisting electric power, 12.9c.; and timber, 19.7c. per ton. The development work consisted of 2769 ft. of drifts, 5356 ft. of crosscuts, 282 ft. of sinking and 1669 ft. of raising, a total of 10,076 ft. The average cost per foot was $5.23, made up of drifting, $5.90 per foot; crosscutting, $4.72; sinking, $10.30; and raising, $4.87 per foot.

Referring to the annual report for 1910-1911, the following comparison is made in diamond-drilling costs:

	1910–1911		1911–1912		Total
	Feet	Cost per Ft.	Feet	Cost per Ft.	Depth of Hole, Ft.
Vertical hole No. 10	733.5	$3.04	473.5	$4.27	1207
Incline hole No. 11	353	1.67	262	4.43	615
Incline hole No. 12	.....	....	312	3.07	312
Total and average	1086.5	$2.62	1047.5	$3.95	

The report states the increase cost for 1911-1912 was due to slower progress of hole 10 as depth was increased and the loss of 300 ft. of drill rods in hole 11.

The milling costs consisted of 70.4% for supplies and 29.6% for labor. Labor for operation was 62.7c. a ton and for repairs 7.8c.; general labor amounted to 17.3c. per ton milled. Supplies for operation were $1.906 and for repairs and maintenance, 17.6c. per ton. The principal operating supplies consisted of 58.1c. for cyanide; 8.4c. for zinc; 6.5c. for lime; 4c. for lead acetate; 1.2c. for acid; 3.9c. for shoes and dies; 7.7c. for pebbles and lining; 20.2c. for water; 53.8c. for power; 20.8c. for heating; 5.2c. for refining and 0.8c. per ton milled for supplies for assaying. The average stamp duty was 3.93 tons.

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Comparative Costs of Power Generated by Oil and Coal

The accompanying chart and tables are presented by Reginald Trautschold, in *Power*, Mar. 4, 1913. Table I

TABLE I. AVERAGE FIXED CHARGES OF THE POWER HOUSE

Based on Plant of 500 Hp.

Oil Burning Plant

Engine room:—

Building, etc.	$10
Engines, accessories, piping, etc.	30
Foundations, installation, etc.	5
	$45 per horsepower

Depreciation.....5% total cost	
Repairs.....2%	
Interest.....6%	Total, her porsepower per year.
Insurance.....1%	Item A—$7.20
Taxes .....2% ½ cost	

Boiler room:—

Building foundations, etc.	$4.50
Chimneys, flues, etc.	7.00
Boilers, etc.	7.50
Oil burning systems (complete)	3.00
	$22 per horsepower

Depreciation.....5% total cost	
Repairs.....2%	
Interest.....6%	Total, per horsepower per year,
Insurance.....2%	Item B—3.63
Taxes. .....2% ½ cost	

Cost of operation:—

Engine room,

Attendance	$1.80	per horsepower per year.
Supplies	0.80	
	2.60	Item C—2.60

Boiler room:

Attendance	$1.10	per horsepower per year
Supplies	0.47	
	$1.57	Item D—1.57

Total fixed charges, per horsepower per year.....$15.00

Coal Burning Plant

Engine room:— Item A—$7.20

Boiler room:—

Building, foundations, etc.	$5.00
Chimneys, flues, etc.	8.00
Boilers, feed pumps, etc.	12.00
	$25 per horsepower

Depreciation.... 5% total cost	
Repairs.....2%	
Interest.....6%	Total, per horsepower per year,
Insurance.....1%	Item B—3.87
Taxes.....2% ½ cost	

Cost of operation:—

Engine room: Item C—2.60

Boiler room:

Attendance	$1.90	per horsepower per year
Supplies	0.90	
	$2.80	Item D—2.80

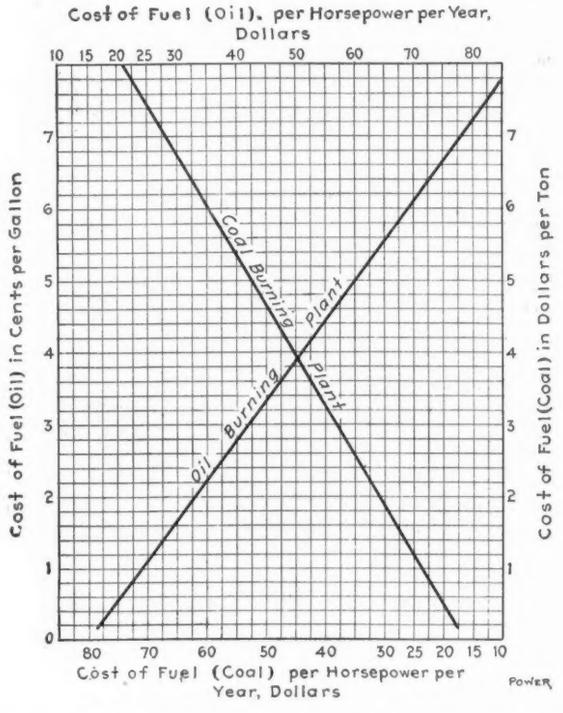
Total fixed charges, per horsepower per year.....$16.47

gives the method of calculating the fixed charges on two 500-hp. plants, one coal-burning and one oil-burning. In Table II is given the fuel cost only for generating a horsepower-year with various prices of oil and coal. These two factors in the power cost are summed up into a total in Table III, which is duplicated graphically by the chart. While based on actual figures obtained for various plants of about 500-hp., the results are applicable within reasonable limits to both smaller and larger plants if absolute figures be neglected and a relative comparison only between oil and coal be sought. This is true because the efficiency of the plant is increased with an increase in size, while the fixed charges per horsepower are reduced, all about in the same proportion.

TABLE II. AVERAGE COST OF FUEL FOR THE POWER HOUSE

Based on Plant of 500 Hp.

Fuel Oil		Coal	
Per gal.	Per hp. per year	Per ton	Per hp. per year
$0.01	$9.00	$1.00	$7.20
0.015	13.50	1.50	10.80
0.02	18.00	2.00	14.40
0.025	22.50	2.50	18.00
0.03	27.00	3.00	21.60
0.035	31.50	3.50	25.20
0.04	36.00	4.00	28.80
0.045	40.50	4.50	32.40
0.05	45.00	5.00	36.00
0.055	49.50	5.50	39.60
0.06	54.00	6.00	43.20


Cost of Fuel (Oil), per Horsepower per Year, Dollars
10 15 20 25 30 40 50 60 70 80
Cost of Fuel (Oil) in Cents per Gallon
Cost of Fuel(Coal) in Dollars per Ton
Coal Burning Plant
Oil Burning Plant
80 70 60 50 40 30 25 20 15 10
Cost of Fuel (Coal) per Horsepower per Year, Dollars
POWER

AVERAGE COST OF STEAM POWER, BASED ON A PLANT OF 500 HP.

TABLE III. AVERAGE COST OF STEAM POWER

Based on Plant of 500 Hp.

Oil Burning Plant		Coal Burning Plant	
Cost of Oil per gal.	Steam Power per hp. per year	Cost of Coal per ton	Steam Power per hp. per year
$0.01	$24.00	$1.00	$23.67
0.015	28.50	1.50	27.27
0.02	33.00	2.00	30.87
0.025	37.50	2.50	34.47
0.03	42.00	3.00	38.07
9.035	46.50	3.50	41.67
0.04	51.00	4.00	45.27
0.045	55.50	4.50	48.87
0.05	60.00	5.00	52.47
0.055	64.50	5.50	56.07
0.06	69.00	6.00	59.67

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Concrete Reflectors for Incandescent Lamps are to be used in the tunnels and machine rooms of the Panama Canal locks, according to the "Canal Record," Feb. 26, 1913. Concrete was adopted as being free from the deterioration affecting metal reflectors in the tropics. Enamel steel fixtures were considered, but were found to be too expensive. The designs are such as to conceal the filaments as far as possible from the eyes without diminishing the amount of light actually reflected. For the roofs of the tunnels, reflectors with four inclined sides are used and in the machine rooms the lights are set in the wall in a reflecting recess, the front of which is closed by an adjustable slide, having a semicircular bottom so that the light can be shut off from the upper portion of the room while illuminating the bottom.

THE MINING INDEX

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

COAL AND COKE

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MATERIALS OF CONSTRUCTION

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21,847—PORTLAND CEMENT—Some Remarks on the Depreciation Factor in the Cost of Producing Portland Cement. Frederick H. Lewis. (Journ. A. S. M. E., Feb., 1913; 4½ pp.)

21,848—TUFA CEMENT as Manufactured and Used on the Los Angeles Aqueduct. Rapier R. Coghlan and Charles H. Paul. (Proc. A. S. C. E., Dec., Jan. and Feb., 1913; 13 pp.) Discussion on paper previously indexed.

MISCELLANEOUS

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21,857—POWER PLANTS—Die Anlagen der Victoria Falls and Transvaal Power Co. G. Klingenberg. (Zeit. des Vereines deutsch. Ing., Jan. 4, 11, 18, 25, and Feb. 1, 1913; 44½ pp., illus.) $2.

21,858—VENTILATION—Measurement of Air in Fan Work. Charles H. Treat. (A. S. M. E., Feb., 1913; 4½ pp.) Discussion of paper previously indexed.

Flotation Tests at Braden

In commenting on the paper on "The Flotation Process"[1] by J. W. Ashcroft, Walter Broadbridge[2] presents some interesting data of tests and practical work done at the Braden Copper Co.'s mill in Chile. The commentator's connection with the Minerals Separation Co., the method of which at Braden is the one discussed, is mentioned as causing him to approach the subject with diffidence.

Mr. Broadbridge states that a plant of 400 tons daily capacity was recently erected at the Braden mill to demonstrate the process. After a test run, it was decided to change from wet concentration to the flotation system, and there is at present under construction a plant of 3000 tons daily capacity.

The ore at the Braden mine contains chalcopyrite, bornite, secondary chalcocite, cuprite, metallic copper and the carbonate and silicates of copper. The ore has proved difficult to concentrate in the ordinary wet way, the recovery having been only a trifle more than 60%. For this reason improvement was sought, and the test run described by Mr. Broadbridge was made.

The head and tailing samples in the test were checked, weighed, and supervised by Braden Co.'s officials, and the head sampler was designed to cut out $^1/_{200}$ part of the total product going to the test. Tailing and concentrate samples were taken every three minutes during the test. Table I shows the summarized result of the test.

TABLE I. SUMMARIZED TEST RESULTS OF FLOTATION PROCESS AT BRADEN COPPER CO.'S MILL

	Tons	% Cu.	% CuS
Head	2726.2	2.61	0.24
Concentrate	271.4	20.82	0.16
Tailing	2452.1	0.56	0.17
Calculated recovery		80.00	87.40
Actual recovery		80.20	87.65

The consumption of reagents was, of H_2SO_4, 3.57 lb. per ton, and of Texas and wood tar oils, 2.33 lb. per ton.

The calculated recovery shown in the table was obtained from the formula

$$\frac{b\ (a - c)}{a\ (b - c)}$$

where a represents the head, b the concentrate, and c the tailing.

Daily screen tests were averaged and the results are shown in Table II.

TABLE II. AVERAGE RESULTS OF DAILY SCREEN TESTS

		Average General Head			Average General Tailing			Average General Concentrate		
Through	On	% Weight	Assay % Cu.	Total % Cu.	% Weight	Assay % Cu.	Total % Cu.	% Weight	Assay % Cu.	Total % Cu.
..	40	4.3	0.68	1.1	6.0	0.66	6.6			
40	60	21.5	1.05	8.5	22.3	0.59	21.9	5.6	15.3	4.2
60	80	9.9	1.96	7.3	10.1	0.46	7.0	11.1	15.4	8.3
80	100	13.4	2.77	14.0	12.5	0.37	7.6	24.8	17.9	21.4
..	—100	50.9	3.62	69.1	49.1	0.7	56.9	58.5	23.4	66.1
		Average assay, 2.66% Cu. Original assay, 2.61% Cu.			Average assay, 0.60% Cu. Original assay, 0.56% Cu.			Average assay, 20.7 % Cu. Original assay, 20.82 % Cu.		

It is to be noted that 58.5% of the concentrate was 100-mesh product, assaying 23.40% copper and containing 66.1% of the total copper recovered.

The recovery from different screen classes was, on 60 mesh, 45.6%; on 80 mesh, 78.9%; on 100 mesh, 88.5%; and through 100 mesh, 83.2%. This represents the average of daily screen tests.

The recoveries obtained in the test run show 80% copper recovery, while from analysis of screen tests it is seen that with a minimum of 60-mesh material, it would be possible to obtain 4.5% more.

It is expected that costs will not exceed 10*d.* per ton treated, made up of power, 0.52*d.*; labor, 1*d.*; spares and stores, 0.48*d.*; reagents, 4.5*d.*; overhead charges, 2*d.*; and contingencies, 1.5*d.* These are based on a scale of 1,000,000 tons per year, power costs being £4 per horsepower year, and sulphuric acid, £2 per ton, manufactured at the plant.

[1]Bull. I. M. M. No. 97, Oct. 10, 1912.
[2]Bull. I. M. M. No. 98, Nov. 14, 1912.

New York & Honduras Rosario

The report of the New York & Honduras Rosario Mining Co., situated at San Juancito, Honduras, for the year ended Sept. 30, 1912, gives a total ore reserve of 127,850 tons in place in addition to 164,216 tons which contain about 29% waste. Its value per ton, as delivered to the Rosario mill, is $17.65, U. S. currency. Exploration work performed on the various veins and crosscuts amounted to 10,282 ft., less by about 3000 ft. than that done during the previous year. The reduction is due principally to the prolonged drought, during which the compressor plant could not be operated at full capacity. Geologic study has gone far toward proving that the theory confining ore deposits to the andesites, is not true. The ore extends into the overlying rhyolites, which cover a larger area, thus materially increasing the life of the mine.

A total of 39,258 dry tons of ore were delivered by the mine, as against 35,813 in the previous year; 28,828 tons were sent to the old mill, and the rest, 10,429 tons, went to the new mill, which was put into commission in July. The milling cost at the old mill was 2.33 pesos per ton for labor and 6.72 pesos per ton for supplies, a total of 9.05, the peso being valued at about 40c., U. S. currency. The new mill has not been in operation long enough to supply definite cost data. The old mill was operated without serious interruption for 24 years. The total operating cost in pesos is as follows: Mine, 18.98; tramway, 1.25; mill (average of old and new), 8.65; surface, 5.98; a total of 34.86, or about $13.95, U. S. currency.

The total production of gold and silver was valued at $965,140, which figure is brought down to $795,795, by differences in plant and in transit. Total expenditures are $615,904, leaving a net income of $178,890. A cash dividend of $30,000 was declared and an additional $500,000 in stock was divided.

Pyrites in Canada

The rapid expansion of the wood-pulp industry in Canada which, in the sulphate process, uses sulphur dioxide, together with the desire to stimulate pyrite mining, has led to the issue of a report on Canadian pyrite by the Department of Mines of that country. A complete description of pyrite occurrences in the Dominion is given.

In the Maritime provinces, while deposits of pyrite are known, little work has been done and small importance is attached to the occurrences. The important deposits of Quebec are frequently copper bearing. The Eustis mine, about seven miles south of Sherbrooke, and the McDonald mine, near Weedon, on the Quebec Central Ry., are in active operation. The Capelton and Howard have

been worked previously rather extensively and other prospects are also known. The output of the Eustis mine is said to have been more than half a million tons. The ore is dressed on the property and the shipped material contains 45% sulphur, usually less than 2% copper and a small amount of precious metals. The McDonald mine, of the East Canada Smelting Co., Ltd., has done extensive development work and shows large reserves. Most of its low-grade ore is shipped to the works of the Nichols Chemical Co. at Capelton. A considerable tonnage of 5% copper ore is also shipped to the United States.

In eastern Ontario former producers, such as the Brockville Chemical Co. and the Bannockburn mine, are at present not operating. The Hungerford mine, in Hastings County, is producing, the average content of the run-of-mine ore being about 35% sulphur. The Ontario Sulphur Mines, Ltd., at its property in the same county, has conducted operations chiefly for development, but up to May, 1911, shipped 4821 long tons of ore averaging 36½% sulphur. The Queensboro mine has had some past production, and the Canadian Sulphur Ore Co. has a property which is being developed to ship 30 tons a day. Other prospects and deposits are also known.

In northern Ontario the Northland Pyrites mine, on James Lake, made some production but is not operating at present. In western Ontario the Helen mine and the Vermilion pyrites mine are well developed and capable of shipping considerable tonnage. North of the Hudson's Bay watershed in the same province other deposits are known, and in the eastern portion of the province the hematite deposits are largely underlain by pyrite.

In British Columbia no pyrite is mined for its sulphur, although sulphide ores are mined for their metal contents in several localities.

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European Practice in Hydraulic Filling

Speaking before the New York section of the American Institute of Mining Engineers, George S. Rice, chief mining engineer of the Bureau of Mines, described various methods of hydraulic filling in European collieries and potash mines, which are quite applicable to metal-mine conditions. The filling of excavated portions of the mines is becoming the standard method of support in Germany, Belgium and France and has been brought to a high state of development.

The character of material used depends on the relative accessibility of the possible sources of supply. Sand, crushed rock, loam and clay are used in varying proportions and granulated slag is not uncommon. The manner of handling the material and the amount of water necessary, varies with its character. Slag requires a good deal of water to move it. Clay moves easily, but is slow to dry when placed and is unsuitable except in mixtures. Material, such as glacial drift, is often handled through a rather elaborate series of screens and crushers. One plant, stowing about 5000 cu.yd. of material per day, dumps it from trains on a trestle and flushes the dumped piles by hydraulic monitors. In the potash fields, rock salt is used as a filling material. Large chambers are excavated in the rock-salt foot wall and the broken salt stowed away in the workings where the potash has been extracted.

The problem of suitable pipe for handling the water and material has received much attention. In Westphalia, porcelain-lined pipe is used, while in Upper Silesia a steel pipe with a removable cast-iron trough-shaped liner, on the bottom side, finds favor.

As the method is practiced, there is no great saving in timber, except in the quality; poorer classes of wood are permissible since it does not have to stand up for any great length of time. The cost will vary exceedingly, probably averaging somewhere between 20 and 30c. per cu.m. Because of the higher cost of labor, this would be greatly increased in the United States and a figure of from 30 to 40c. per cu.yd. is given tentatively when material can be obtained within two or three miles. The use of the term "hydraulic stowing" was recommended for the general process of flushing ground or fine material into mines to fill the excavations.

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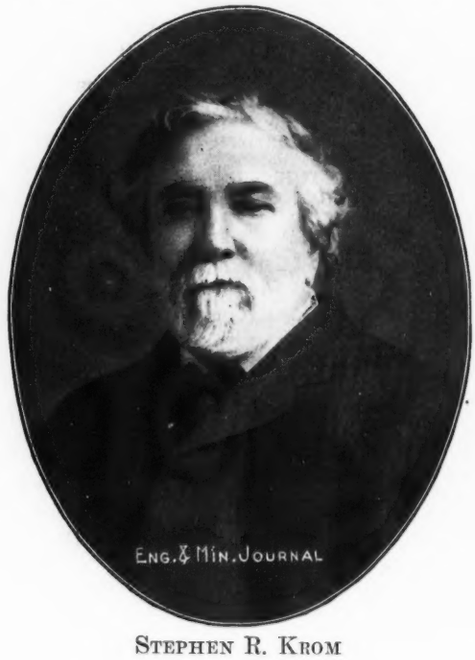
Stephen R. Krom

Stephen R. Krom, well known for many years as a mechanical and mining engineer and manufacturer of mining machinery, died suddenly of angina pectoris at



STEPHEN R. KROM

his home in Plainfield, N. J., on March 21. Mr. Krom was a descendant, on his mother's side, of Louis Du Bois, a French Huguenot who come to America in 1660 and settled near Fishkill-on-the-Hudson. On his father's side, he came from a long line of that name, two of whom emigrated to America from Holland at an early date. He was born March 31, 1836 at Shokan, Ulster County, New York, the little town now known on the map of the state as Ashokan.

In early life Stephen R. Krom left the farm to make his way. When he was about 14 years old, he helped to make leather at the tannery of his brother-in-law, Harvey S. Ladew, afterwards a famous leather man, first in the firm of Hoyt, Fayerweather & Ladew, and later of Fayerweather & Ladew. His early education was obtained at various village schools and while still a boy about 18 he came to New York City. Here he started to

follow the line that he had early shown an aptitude for—that of mechanics. He worked as an apprentice in the shops of the American Engine Works and became a proficient journeyman mechanic. By this time his inventive genius had begun to manifest itself and he invented one of the first engine lathes, which was afterwards improved and patented. The Civil War found him manufacturing ammunition for the Government in the shape of cartridges and primer caps.

At the close of the war Mr. Krom started in real earnest at what was to be his life work, the manufacture of mining machinery. The first development that he made was the improving and perfecting of the Bliss type of rock breaker. This was followed by what proved to be a revolution in the art of ore dressing, the introduction of belted rolls for fine crushing. After an anxious period, through which he fought stubbornly for his convictions, he proved his claims notwithstanding opposition. In this connection, C. Q. Payne, in a paper presented before the American Institute of Mining Engineers, February, 1912, said:

> To Stephen R. Krom belongs the credit of the pioneer in introducing the belted high-speed roll, which has had its origin and a marked development in this country. His notable contribution to the art was in the use of a single bedplate or frame supporting the rollshafts, to which levers holding the movable roll-bearings were pivoted. He also made use of steel tension rods to support the crushing strains, and of hammered-steel tires for the crushing surfaces. These changes brought the design of crushing rolls to a high level.

The Krom rolls became known rapidly and favorably in all quarters of the globe. Among some of the famous mines where these rolls performed their part: Mount Morgan Queensland, Australia; Imperial Mines, of Japan; Hidalgo mines, Parral, Mexico; San Luis, Durango, Mexico; Calumet, Calumet, Canada; Golden Reward, Deadwood, S. D.; Selby Smelting & Lead Co., California; Tenabo, Cortez, Nev.; New Jersey Zinc Co., Newark, N. J.; Alpha Portland Cement Co., Easton, Penn.; New England Quartz Co., Roxbury Falls, Conn.; and the Atlas Portland Cement Co., at Hastings-on-the-Hudson, New York.

The rolls were followed in quick succession by other equally valuable improvements in various forms of mining machinery. Among these were the well known pneumatic jig or dry concentrator, and the dry kiln, which was worked out in conjunction with C. A. Stetefeldt, the famous metallurgist and furnace expert. Ore feeders, screens, roasters, mixers and numerous other devices were rapidly developed; while even at the time of his death he was at work on an improved type of roll, which was being built without caps, and a cement mill pulverizer.

The Krom system of ore dressing which he finally evolved met with approval of such famous mine owners and superintendents as Simeon Wendben, Philip Argall, Charles Butters, James I. Long, R. D. Clark, Albert Arents and others. Professor T. Egleston, of Columbia University, New York, and Robert H. Richards, of the Massachusetts Institute of Technology, have included minute descriptions of the system in their various textbooks, while other writers have made it the subject of numerous papers. Mr. Krom was a member at various times of the American Institute of Mining Engineers, the Institute of Mechanical Engineers and a life member of the American Institute.

Mr. Krom's inventive genius took a wide range. At one time and another in his odd moments he devised a self-feeding stove, coffee-mill machinery, cement pulverizers, chemical grinders and mixers and a number of types of leather-working machines. Mr. Krom retired from business about seven years ago and spent these last few years of his life in his home at Plainfield, N. J., where he had lived for nearly 40 years. He took a great interest in the affairs of his town and, while he never held public office, he was ready at all times to lend assistance with sound advice and was a generous subscriber to public institutions.

Brought up in the Baptist faith, he belonged to churches of that denomination for a great many years. At the founding of the Unitarian Church in Plainfield, he joined as a charter member and became an enthusiastic supporter of its principles. He was a trustee of the church and a member of several committees at the time of his death. Mr. Krom was a widower, his wife, M. Francesca, dying in 1900. He leaves four sons and two grandsons; the sons are S. Arthur, Louis J., Frederick H., and Stanley V. Krom.

Committee on Economic Geology

Upon invitation of Mr. Rand, a number of the geological members of the American Institute of Mining Engineers met at dinner at the Engineers' Club, on Mar. 25, and organized a committee on economic geology, comprising the following:

Waldemar Lindgren, Chairman.
John W. Finch, Vice Chairman. R. A. F. Penrose, Jr., Vice Chairman.
Louis C. Graton, Secretary.

James F. Kemp	New York
John D. Irving	New Haven
C. K. Leith	Madison, Wis.
Ezequiel Ordonez	Mexico City
Reno H. Sayles	Butte
Henry Landes	Seattle
H. A. Buehler	Jefferson City, Mo.
Heinrich Ries	Ithaca, N. Y.
Josiah E. Spurr	New York
Marius R. Campbell	Washington
Ralph Arnold	Los Angeles
H. Foster Bain	San Francisco
Horace V. Winchell	Minneapolis
C. R. Corning	New York
Frederick L. Ransome	Washington
John M. Boutwell	Santa Barbara, Calif.
H. L. Smyth	Harvard University
William G. Sharp	Boston
Alfred Church Lane	Tufts College, Mass.
William H. Emmons	Washington
R. V. Norris	Wilkes-Barre, Penn.

The purpose of this committee is to develop contributions on the subject of economic and mining geology and to promote discussion of the same.

Quincy Mining Co.

The report of the directors of the Quincy Mining Co., of Michigan, for the year 1912, shows a production of 30,040,360 lb. of mineral, yielding 20,634,800 lb. of refined copper. The copper sold yielded $3,351,359 and the profit on silver was $30,227. The mining expense was $1,778,824, the mining profit $1,089,673. Additional receipts brought the total profit up to $1,104,918. Dividends paid during 1912 amounted to $550,000. A dividend of $1.50 per share, or $165,000, was declared payable Mar. 24, making a total of $605,000 paid from the earnings of the past year. The total assets of the company are $1,196,622 and total liabilities, $266,997, leaving an excess of assets over liabilities of $925,645. To this amount should be added supplies and properties at the mine and smelting works, making $1,233,278 total excess of assets over liabilities.

CORRESPONDENCE AND DISCUSSION

Cost of Cyanidation at Tonopah

In the synopsis of Herbert A. Megraw's article on "Silver Cyanidation at Tonopah—II," in the JOURNAL of Mar. 1, with reference to the Desert mill at Millers, Nev., the statement is made that, "Costs are higher than those obtained with modern all-slime plants," and in the text of the article, one reads: "It would, of course, be impossible for a mill of this kind to beneficiate ores at a cost comparable to that attained in modern mills."

It is possible that what I believe to be an erroneous impression may be gained from the above statements. If Mr. Megraw refers to the modern mills of Mexico or modern mills of the United States, treating straight gold ore, the statements are correct, but if he would only refer to the mills, both modern and antiquated, of the Tonopah district, which would be a fair basis for a comparison of costs, I believe an investigation would show that the operating costs of the Desert mill, granted to be antiquated, have been, and are still, lower than those of any other mill in the district.

For the eleven months of the present fiscal year the direct costs at the Desert mill are, $2.489 per ton, indirect $0.146, total $2.635 per ton. Direct costs include all labor, power and supplies used in operating the mill together with all costs of repairs, renewals and upkeep of plant and equipment. Taxes, insurance, legal and home office expense are included in the indirect costs.

A. R. PARSONS.

Tonopah, Nev., Mar. 8, 1913.

It is possible that Mr. Parsons has misinterpreted the statements to which he refers in my article dealing with cyanide practice at Tonopah. What I meant was that a plant operating on the old separate-treatment system, without the most modern machinery and appliances, cannot possibly reach the low level of cost attainable in all-slime plants where every improvement is at hand. Of course, to make any comparisons of value, the scale of operations must be approximately the same, and for this reason the Desert mill, treating 500 tons, cannot be compared to the other mills in Tonopah which handle 150 tons or less per day. An instructive contrast might be made between the Desert mill and the new Belmont mill, which treats approximately the same tonnage of the same kind of ore. Undoubtedly the Belmont, a modern and efficiently operated installation, is treating its ore at less cost than the Desert mill, or will be doing so when normal conditions can be maintained. My statement was not limited to the Tonopah district alone.

I am aware of the cost of milling at the Desert mill and consider it exceptionally low for a mill of that kind. I think Mr. Parsons will agree with me, however, in believing that a mill equipped with every modern improvement can treat the same ore as efficiently and at less cost.

H. A. MEGRAW.

New York, Mar. 18, 1913.

Secrecy in Mining

There has been a great deal published in the newspapers concerning the new mills in Butte, which I have been attempting to verify, but everything they are doing is so shrouded in secrecy that it is almost impossible to get anywhere near the inside of the mills, let alone obtain any good information. There is no getting into the Butte & Superior mill at present for anyone with less prestige than a holder of the majority of the stock at least.

The erection of Clark's zinc mill has only been started. As for the Bullwhacker mill, I managed recently to get in through a door in the top of the mill and climbed down the ladders while no one was about, and found that at that time there was one small tank of ore being leached with sulphuric acid under agitation and the copper being electrically precipitated upon a half-dozen copper plates.

With regard to the Wolvin properties, Mr. Wolvin is very decided in not wishing any information published at present, as they are still only in the experimental stage. As for the steam shovels mentioned in the newspapers as being on the Wolvin properties, that talk must have been the emanations of a highly disorded mentality, for the nearest they have come to steam shovels yet, is to have three or four men engaged in breaking down rock from the hillside with powder, pick and shovel. These mill people so far seem to be vying with each other as to who can make the wildest reports.

H. F. NORMAN.

Butte, Mont., Mar. 19, 1913.

Graphics Applied to Fault Problems

The methods of solving fault problems given by E. R. Rice, in the JOURNAL of Mar. 22, seem to me more ornamental than useful. The difficulties caused by faulting do not consist so much in handling the data pertaining to the fault as in obtaining those data in the first place. Once given the necessary information there are many rough methods available by which the position and movement of the fault can be obtained.

Any expressions of fault dips, strikes and movements need to be only roughly quantitative. It is an unfortunate fact that faults are never planes and are rarely surfaces capable of mathematical expression. Let anyone that is skeptical break a rock and note the broken surface. The result is a miniature of what large-scale fracturing of the rocks of a district effects. We may determine with some accuracy the shape, position and relative movements of a fault within explored areas, the more important information, namely, where this fault will extend and what its effect will be in unexplored areas, can only be shrewdly guessed at. Obviously the application of refined methods of solution under such conditions is a waste of energy.

ROBERT OLDS.

New York, Mar. 30, 1913.

EDITORIALS

Josiah Quincy and the Hawthorne Case

It has been brought to our attention that certain remarks in the editorial reviewing the Hawthorne case, in our issue of Mar. 22, may be read in such a way as to do injustice to Mr. Quincy. Inasmuch as he was mentioned as being among the four men at the bar, it might possibly be assumed from our language, which was inadvertent, that he had been found guilty of the crime charged, as well as the other men who were named. Of course, it was not our intention to imply any such thing. We stated in another article in the same issue that Mr. Quincy had been acquitted.

As a matter of fact, all of the counts of the several indictments of Mr. Quincy were dismissed by order of the court, except one on which Mr. Quincy's case was submitted to the jury. The jury found a verdict of "not guilty." Therefore, by the action of the court and of the jury, Mr. Quincy was exonerated on all counts of all indictments against him.

Storm and Flood

The disasters caused by the tornadoes in the West and the Southwest were speedily eclipsed in the public view by the greater damage resulting from the floods in the Ohio and Mississippi valleys, the full extent of which is not yet known. It is, as is usually the case, not quite so great as at first reported, but is, nevertheless, great enough to be a very serious calamity, which in the outcome will affect the whole community to a certain extent.

Considering the floods wholly in an economic sense, and entirely apart from the loss of life and the human suffering caused, it must appear that many manufacturing and some mining interests will be seriously affected. The trouble most apparent at first is the damage to the railroads, which will require a considerable expenditure of money to make good, while the delays in transportation will entail a heavy loss to many interests. Next to this comes the interruptions in operation of many steel mills and blast furnaces in western Pennsylvania and Ohio, which come at a time when mills are generally behind in their deliveries and will put them still further in arrears. Mining interests have not suffered to any considerable extent directly, though some coal mines are reported flooded and damaged in Ohio, Indiana and southern Illinois. The railroad breaks, however, will interfere badly with the coal trade, especially with that to the Lake ports, which is just opening. Early deliveries of ore and coke to furnaces will also be affected.

It is said in some quarters that a push will be given to the steel trade by the emergency demand for bridge and other material for repairs and rebuilding. This is true, but it is a very limited view of the case. The property destroyed by storm and flood is a total, or almost total, loss. It is so much property which has disappeared and must be made good in one form or another. It will in the end diminish the amount available for new construction, and in that way will decrease the demand for iron and steel to an amount far greater than the requirements for emergency repairs will increase it. Loss by war or public calamity is an entire loss, and will sooner or later make itself felt in business. Fortunately, our present conditions are such that we can meet these losses without any extraordinary exertion or disturbance.

The Scandal of the Comstock

In an article under the above caption in the JOURNAL of Oct. 19, 1912, we described the blight hanging over mining on the Comstock Lode during recent years through the control of most of its mines by San Francisco stockbrokers. The Comstock has always had some such blight, but in former years it was rich enough to live through it. Since the stealing of the mill-ring was abolished in the early '90s, there have been no great pickings out of the mines, but the resources of persons with gambling instincts on the Pacific Coast have ever been fruitful. This kind of exploitation has not, of course, been conducive to the welfare of the mines.

A few years ago the Mexican company fell into the hands of some people who were minded to do real mining. They put Whitman Symmes, an engineer of parts, in charge at Virginia City. He introduced reforms in methods, both technical and otherwise, that previously had not there been heard of. The operation of these mines requires concerted action, especially in the matters of drainage and ventilation, which has been done, so far as it has been done at all, through the Comstock Pumping Association, of which Mr. Symmes was also made the head. However, he experienced difficulties, which finally caused him to bring things to a head.

This he has done by the issuance of a report, in the form of a book of 184 pp., addressed to the directors and stockholders of the Mexican, Union, Savage, Hale & Norcross, and Julia companies, which is called a "Brief Statement of the Situation on the Comstock, the methods of mining for assessments, and the intentional mismanagement of the middle and north end mines by a clique of six crooked brokers, composed of A. F. Coffin, Herman Zadig, B. F. Shaw, J. H. Berghauser, W. B. Bannan and W. H. Moise, showing the reasons that mining there cannot now be other than unprofitable." The remedy for existing conditions, in the opinion of Mr. Symmes, is for stockholders to deal only with brokers who are not attempting to manipulate mine management and to see that their stock stands in their own name or in the names of such brokers. Mr. Symmes' report is issued from the office of the Mexican Gold & Silver Mining Co.

Mr. Symmes goes minutely into the details of conditions prevailing on the Comstock, revealing much that heretofore has been known only in a general way. His accusations against the six brokers that he has named are specific and direct. He states that if they complain that

they are libelled, he will be glad to answer them in a court of law.

Mr. Symmes' charges ought to develop whether the nominal owners of the Comstock mines really want to mine or only to gamble. If the latter, we are disposed to think that the Department of Justice ought to look into things.

The Rally in Copper

The last week has witnessed a sharp rally in the price for copper, due partly no doubt to anticipation of favorable statistics for March, but probably in a greater degree to the realization that production has lately not been increasing, to say the least, while consumption has been holding its own, also to say the least. The favorable turn in European affairs has, moreover, been contributory.

The clearances of copper for export were larger in March than ever before recorded, 41,702 long tons being reported. Of course, no intelligent person will be deceived by that. A large part of the exportation must have been shipped by sellers here on their own account, in other words, a transfer of stock, such as has frequently occurred. The theory is, no doubt, that European manufacturers have let their stocks run low and soon will be desirous of taking this copper out of store in Hamburg, Rotterdam, etc., probably at a good price for the prompt delivery. Also a rise in ocean freights to certain ports was scheduled for Apr. 1, which it was desirable to anticipate.

Anyway, there is a much better feeling all around, which alone is worth a substantial rise in the price for the metal. The price that lately has been prevailing, 14½@15c., is a fine price—a price at which all of the producers of any consequence have been making money and keeping up their dividends—but more pessimism has prevailed and there have been gloomier prognostications than 18 months ago, when the price was around 12@ 12½ cents.

We do not believe that copper is now going to start right up to 17½c. again, much less to resume the deferred advance to 20c. that erstwhile was contemplated. We anticipate that there will be a lot of copper for sale at about the present prices, and no great disposition to try starving the consumer and pegging the price once more. The outlook this year is distinctly for dear money and most producers will rather have money than copper. Willingness to trade will not be an indication of pessimistic anticipation or a foreboding of evil, but rather will it be a sign of a healthy state of the industry.

John Pierpont Morgan

In the death of John Pierpont Morgan, America lost one of the gigantic figures of its history, a figure of the quality of Bismarck and Rhodes. He rendered extraordinary and enormous services to the nation as a financier and as a builder of railway and industrial enterprises. He stood ever for construction, never for destruction. He wielded great power, more financial power than any one man ever wielded before him, but he wielded it for good. Who can measure his last great service—the staying of the panic of 1907? Such power as he exercised and such service as he rendered could not be founded upon money alone. Beneath it stood his wisdom, integrity and strength of character, inspiring the confidence that caused people to follow him and lean upon him. In future years his personality will, we prophesy, loom even larger than it has during the last 20 years.

Mine Accidents Again

Conversation with those in immediate control of mining operations usually reveals keen interest on their part in the accident records of their mines. Superintendent, foreman, even manager, is proud of it if his mine is regarded as safe; if it has a bad reputation, he is eager with excuses. There is no question about sentiment being right with those immediately concerned. A death underground is regarded with horror by men and bosses, as a thing to be avoided at all costs. But too frequently sentiment fails to crystallize into action. Simple, inexpensive, obvious precautions are inexcusably neglected. Where accidents are avoided it is often by good luck and not good management; when they occur it is only what might have been expected. We are speaking, of course, about the average mine, not about the best. Cases of properties admirably administered in this respect are known to all.

But how many mines systematically test the cage safety-catches; how often are the actuating springs replaced? Safety dogs will not catch in slippery guides, it is urged, but if they catch on 10% of the guide length they are worth while. In how many headframes are the guides brought together under the sheaves to pinch and hold an overwound cage? How many miners were ever actually fired for working under dangerous ground? Until the inevitable explosion occurs, what mine provides separate magazines for powder and caps? The precautions mentioned are universally recognized as necessary; they cost almost nothing; yet one sees them neglected on every hand.

In a certain Mexican mine the manager boasted of only one death in four years, and that, it must be said, was unavoidable. A good record indeed! Yet, that mine had a shaft almost untimbered; the springs on the safety catches were set rigid with rust; timbering was reduced to a minimum in the stopes, though the hanging caved repeatedly from level to level, always, as it happened, when there was nobody in the mine; the hoisting engineers were careless and unskillful; and the workings were flooded with carbon dioxide, which gathered in old winzes and underhand stopes, an insidious trap, invisible, and unlike water, nonsupporting to any man who should fall in. One wonders of just what that manager boasted?

The attitude of mine officials is to a great extent fatalistic. Because accidents do happen in spite of all precautions and cannot be quite eliminated, they regard the task as hopeless and take a chance. But if absolute safety be unattainable, why not, with a little effort, make the mine 50% more safe, or even 5%. Surely, in the case of human life, that is worth while. Education is necessary in the matter, education and the compilation of statistics on the causes of deaths and accidents, and in addition, legislation.

Tasmania and New South Wales show commendable promptness in issuing their final mineral statistics for 1912. The report of the Department of Mines of the former is dated in February, that of the latter in March. But British Columbia did still better, January twenty-third!

BY THE WAY

It is reported by *Echo des Mines* that a new company is being organized to put up a works in the Pyrenees for the electric smelting of zinc ore by the Cote-Pierron process.

⁂

The tin production of Nigeria is attaining considerable proportions, the output of concentrates having been 247 long tons in February last, against 456 in January and 311 in December. Apparently the tin supply of the world will be augmented from this source although the speculative hopes may not be fully realized.

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A recent letter from the Canadian field described an ore deposit as being in rocks of the "Free Cambron" age. This is a reminder of the Arizona prospector, who asserted that his prospect was in the "Hurricane" rocks, which was, by inquiry, developed to mean the Archean rocks. These are on a par with the self-made geologist (?) who described certain formations as being "uncomfortable."

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Remembering the great project of a North and South American railway, advocated long before the Civil War by Clinton R. Helper, it may be noted that only 18 miles between New York and Guatemala City cannot now be traveled by railroad. Construction thence to San Miguel, Salvador, is well advanced, and between San Miguel and the Panama Canal (600 miles away) many links are completed, says a report to the Pan-American Railway Committee. In South America only 175 miles are lacking from Buenos Aires and Lake Titicaca, while thence to Cuzco, Peru, the line is complete.

⁂

The *American Machinist* remarks: "Correspondents in our columns have been unanimous in saying that writing for publication was of direct benefit to them. But we seldom have such clear-cut testimony on this point as is contained in a recently received letter from an engineer of a large machine-building plant. After having prepared two or three articles, dealing with his own work, he writes:"

> I find that working up these articles compels me to get a much clearer knowledge of many of the details of conditions and processes, which I thought I knew quite fully before, and think that the writing has helped me very materially in getting a clearer grasp of the things that I deal with daily.

The experience here reported is, we believe, invariable. If you want to know much of the subject of your work, undertake to write about it. If you want to know very much, undertake to teach it.

⁂

Discussing the question of slag and sample losses at a recent meeting of the Institution of Mining and Metallurgy, Lewis T. Wright said that in his opinion the analysis of the furnace samples, as representing the copper that was left in the slag, was of no value at all unless supported by other evidence. It was well known, said Mr. Wright, that things are not always what they seem. Going back to the days of muzzleloading guns, he recalled the time when the breechloaders were first being used. An old gamekeeper, who had never seen such a weapon, was allowed to look through the barrels against the light. When he put the gun down he remarked, "I guess if we cou'd do that to those muzzleloaders of ours there would be some awful revelations." Mr. Wright suggested that if, instead of making use of furnace slag analyses as a control for copper losses, managers would go to the slag dump and make a systematic sampling of it as they would in the case of a face of ore in the mine, there would be some "awful revelations." He said that he once made a traveling acquaintance who was very prosperous in appearance, judging by the amount of jewelry he wore; this man confided that it was his business to travel around the world buying up old slag dumps, and in the course of the conversation some remarkable things were related regarding dumps that the man had bought at various times—things which would make the hair of a conscientious general manager stand on end, though, of course, many of these were in connection with very old mines and early attempts at smelting.

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That gold, silver and other rare minerals can now be located by the attraction of the magnetic needle is the startling announcement in the Deadwood *Pioneer-Times*. No., the Stauffer brothers have not moved their "Spanish needle" plant to the Black Hills. Local talent has been drawn upon. The inventor, according to the Deadwood paper, is C. D. Berg, of Lead, S. D., and he has perfected an instrument, the "forceful electromagnetic oscillations or vibrations of which over an ore deposit are simply wonderful." The inventor reports that he was first confused by the attraction of many different minerals so that he could not distinguish one from another, but subsequently learned how to discern the different kinds of minerals, "even to three or more different kinds of minerals in one ore." A demonstration of the instrument was given by the inventor, "whose body constitutes a great part of the instrument." We quote the observations of the *Pioneer-Times*: "Picking up his instrument, which consists of a battery suspended to an electric cord, the other end of which cord is provided with a metallic handle, or rather a dry-cell battery with a handle, which he firmly held in his hand, Mr. Berg placed it over a piece of gold-bearing ore, and immediately the instrument began to oscillate over the ore. He then told us to watch him closely, and proceeded to place a small bit of some material between his teeth. While holding this material between his teeth and being careful to keep his lips from coming in contact with it, the instrument would work uninterruptedly, but the moment he closed his lips against the bit of material and the flesh part of the lips came in contact with it, the current evidently emanated from his body and was immediately cut off, and his instrument ceased to work while the circuit was thus cut off." Like many other inventions, its success seems to depend upon the constancy with which the inventor can keep his mouth open, writes a Black Hills metallurgist. Another curious feature about these wonderful devices is that they develop such affection for their inventors that they refuse to work in any other hands. It is fortunate that the inventors are of an altruistic temperament, which prevents them from going out and locating all ore deposits for themselves. Still they may not be averse to disposing of an interest in their invention to others, and we await with bated breath the announcement that two or three more Homestakes have been located in the Black Hills.

Bethlehem Steel Co.

At the annual meeting of the Bethlehem Steel Co. on Apr. 1, Charles M. Schwab told the shareholders that:

Business is prosperous. The company has plenty of orders. Everything is moving most satisfactorily, and we are very pleased with the outlook this year. I purchased the Titusville Forge Co. last week, to supply our western branch with forges. It cost about $500,000, and we are going to make extensive additions there this year. Total addition and betterment expenditures at Bethlehem this year will amount to $6,500,000. We are spending $600,000 at the Harland & Hollingsworth plant for new car shops.

A stockholder at the meeting asked President Schwab what effect the Panama Canal opening would have on the Bethlehem company. He replied:

The Panama Canal will benefit the company by rendering available the South American ore supply. That ore is the cheapest I have ever had. It will take three years to develop it. On this account the Bethlehem Steel Co. has not yet ordered any ore-carrying steamships, for the steamships can be obtained quicker than the preparations for ore shipments. The ore in South America is free from phosphorus, and can be used directly in the openhearth process. The ore is situated only four miles from the coast. I want to ship about 2,000,000 tons a year, but will not get full shipments before the end of 1915. There are 60,000,000 tons of ore in sight—the best ore I have ever known.

Mr. Schwab said that any reduction in tariff will particularly hurt the Eastern steel mills. Belgium, paying one-third the wages paid here, can land steel in New York harbor as cheaply as Bethlehem can.

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Chronology of Mining for March, 1913

Mar. 1—Fire destroyed the laboratory at the Boston & Montana smeltery, at Great Falls, Mont.

Mar. 2—Operations at the Butte Central cyanide plant were begun.

Mar. 3—Operations were begun in the new McIntyre mill, at Porcupine, Ontario.

Mar. 5—New mill of the Manhattan Big Four Mining Co., at Manhattan, Nev., began operations.

Mar. 7—Attorney-General of Texas announced that the total amount of penalties which the state is asking of the Magnolia Petroleum Co. and the Corsicana Petroleum Co., in the suit filed at Greenville, Texas, is $100,000,000.

Mar. 7—In the suit brought by the Government against the U. S. Steel Corporation, James Gayley, former vice-president, testified that the Steel Corporation did not have a monopoly in the production of iron ore.

Mar. 8—The initial convention of the Alaska legislature was held at Juneau.

Mar. 10—The report of the Pennsylvania state anthracite mine-cave commission was submitted to the legislature.

Mar. 12—Operations of the Swastika mill, at Swastika, Ont., were begun.

Mar. 14—Julian Hawthorne and Dr. William J. Morton were sentenced to imprisonment in Atlanta penitentiary for one year and one day; Albert Freeman was sentenced to a term of five years and three days. These men were found guilty of of using the mails in the promotion of fradulent mining enterprises in Canada.—About 250 trammers went on strike at the Mohawk copper mine in the Lake Superior copper country, but returned to work a few days later.

Mar. 18—A serious fire broke out at the President colliery, near Bochum, Germany, the superintendent and several miners losing their lives.

Mar. 19—Stephen R. Dow was sentenced to a term of not less than eight nor more than 12 years, for fraudulently misappropriating funds of mining companies, of which he was president.

Mar. 22—Suit was started against the Bunker Hill & Sullivan Mining Co., by the Stewart Mining & Milling Co., in which F. Augustus Heinze is interested, over alleged overlapping of mine claims in the Cœur d'Alene district, Idaho.—Sixty men at Beaver mine, at Cobalt, Ontario, went out on strike.

Mar. 28—Operations at Cananea, Mexico, were suspended because of inability to ship in fuel and supplies due to wrecking of railroad bridges and plundering from rebels.

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Mining Dividends for March

Dividends reported to the JOURNAL by 28 United States mining companies show March dividends of $9,450,635, while 15 iron, allied industrial and holding companies paid $12,818,606, and 14 Canadian and Mexican companies paid $1,768,572. These figures are in comparison with $4,983,399, $10,826,143, and $1,479,100 reported in March, 1912, for the three respective classes. The figures for the first three months of the year are: United States mining companies, $19,833,814; holding and industrial, $28,278,906; and Canadian and Mexican companies, $6,566,936.

United States Mining Companies	Situation	Per Share	Total
Bunker Hill, g.	Calif.	0.05	10,000
Bunker Hill & Sullivan, l. s.	Ida.	0.20	65,400
Calumet & Arizona, c.	Ariz.	1.25	745,441
Calumet & Hecla, c.	Mich.	10.00	1,000,000
Champion, c.	Mich.	1.00	100,000
Daly-Judge, s. l.	Utah	0.15	45,000
El Paso Con., g.	Colo.	0.12½	61,250
Federal M. & S., l. s.	Ida.	1.50	179,791
Fremont, g.	Calif.	0.05	182,000
Frontier, z.	Wis.	2.00	2,500
Golden Cycle, g.	Colo.	0.02	30,000
Hecla, l. s.	Ida.	0.07	70,000
Homestake, g.	S. Dak.	0.65	141,960
Homestake, g.	S. Dak.	15.00*	3,276,000
Isle Royale, c.	Mich.	1.00	150,000
Moscow, g. s. c. z.	Utah	0.01	8,200
Nevada Con., c.	Nev.	0.37½	749,790
North Star, g.	Calif.	0.20	50,000
Pittsburgh-Silver Peak, g.	Nev.	0.02	55,800
Quincy, c.	Mich.	1.50	165,000
Success, z.	Ida.	0.02	30,000
Superior & Pittsburgh, c.	Ariz.	0.38	569,922
Tom Reed, g.	Ariz.	0.07	63,669
United, c.	Wash.	0.01	10,000
United Verde, c.	Ariz.	0.75	225,000
Utah Copper, c.	Utah	0.75	1,182,412
Yellow Pine, l. z. s.	Nev.	0.02	19,000
Yukon Gold, g.	Alas.	0.07½	262,500

Iron, Industrial and Holding Companies	Situation	Per Share	Total
Am. Sm. & Ref., com.	U.S., Mex.	1.00	500,000
Am. Sm. & Ref., pfd.	U.S., Mex.	1.75	875,000
Colo. Fuel & Iron, pfd.	U.S.	35.00	700,000
Crucible Steel, pfd.	U.S.	1.75	427,638
General Asphalt, pfd.	U.S.	1.25	164,120
General Chemical, com.	U.S.	1.50	122,269
Greene Cananea, c.	Mex.	0.25	618,828
Harbison Walker, com.	U.S.	0.50	90,000
International Nickel, com.	N.J.	2.50	948,133
International Sm., & Ref.	U.S.	2.00	200,000
National Lead, com.	U.S.	0.75	154,914
National Lead, pfd.	U.S.	1.75	426,433
Phelps Dodge & Co.	U.S.	2.50	1,125,000
Pitts. Steel., pfd.	U.S.	1.75	112,500
U. S. Steel, com.	U.S.	1.25	6,353,781

Canadian, Mexican and Central American Companies	Situation	Per Share	Total
Alacran, g. s.	Mex.	2.00	19,200
Crown Reserve s.	Ont.	0.05	88,441
Angustias Dolores, g. s.	Mex.	1.50	1,500
Blanca, g. s.	Mex.	0.90	11,250
Dos Estrellas, g. s.	Mex.	2.50	750,000
Exp. Encino, g. s.	Mex.	1.00	3,000
Granby, s. l. c.	B. C.	1.50	222,721
Hedley, g.	B. C.	0.50	60,000
Hollinger, g.	B.C.	0.15	82,500
Kerr Lake, s.	Ont.	0.25	150,000
Mexico Mines of El Oro, g. s.	Mex.	0.96	174,960
Peñoles, s. l. g.	Mex.	1.25	150,000
Protectora y Anexas, s.	Mex.	0.50	5,000
Standard, s. l.	B.C.	0.02½	50,000

*Stock dividend.

PERSONALS

Etienne A. Ritter, of Denver, is making mine examinations at Rico, Colorado.

H. E. West has left London for India, in the employ of John Taylor & Sons.

W. H. Shockley expects to be in Palo Alto, Calif., about the latter part of April.

Harry J. Wolf has completed mine examinations in San Miguel County, Colo., and has gone to Idaho Springs.

Thomas L. Livermore has resigned the management of the Lewis Mine, near Telluride, Colo., and has gone to Boston.

Charles Janin, of San Francisco, has gone to London, where he expects to make his headquarters during the next year.

H. S. Knight has left Akron, Ohio, to take charge of the hydraulic mine of the Glacier Creek Gold Mining Co., at Porcupine, Alaska.

Frederick Conlin, Plainfield, N. J., of the Bethlehem Steel Co., has gone to Coquimbo, Chile, to inspect the company's new Tofo mine.

Henry B. Kaeding has gone to the Pacific Coast on professional business which he expects will occupy him there for about a month.

Frank H. Probert, of Los Angeles, Calif., is making a geological investigation of the Boston-Corbin Copper Co.'s property at Corbin, Montana.

Elmer W. Jones, Iron Mountain, Mich., has accepted the position of superintendent of the Whiteside mine, of the Shenango Furnace Co., on the Mesabi range.

W. H. Hartman, for a number of years engineer for the Mohawk Mining Co., has been promoted to the superintendency, succeeding Willard J. Smith, resigned.

J. W. Crowdus, formerly mill superintendent, Socorro Mines Co., Mogollon, N. M., is at Cuico Minas, Hostotipaquillo district, Magdalena, Jalisco, Mexico, acting as mill superintendent in charge of construction of new mill.

I. H. Barkdoll, assistant mine superintendent of the Copper Queen, at Bisbee, Ariz., has been appointed mine superintendent at the Old Dominion, succeeding George Kingdom, who will go to Cananea the middle of April.

George L. Drew, formerly general manager of the Steel Co. of Canada, Ltd., Hamilton, Ont., has accepted a similar position with the Lebanon Valley Iron & Steel Co., Lebanon, Penn. Mr. Drew had been with the Canadian company for 23 years.

Andrew W. Wheeler has been elected president of the Pottstown Iron Co., Pottstown, Penn., succeeding the late Theodore H. Morris. Leonard Peckitt, president of the Empire Steel & Iron Co., was chosen vice-president, and William P. Morris was elected a director to succeed his father.

Garry Le Van, who has been superintendent of the blast furnaces at La Belle Iron Works, Steubenville, Ohio, has been appointed general manager of the plant, succeeding W. D. Crawford, former vice-president and general manager, who was elected president upon the resignation of Isaac M. Scott.

Charles E. Van Barneveld, a graduate of McGill University, Montreal, and head of Mining Department, Minnesota School of Mines, for the past 14 years, is appointed chief of department of Mining and Metallurgy of the Panama-Pacific International Exposition. He expects to assume active charge at the end of April.

John H. McClement, New York, was made chairman of the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., at a meeting of the directors held recently in New York. Gen. Otto H. Falk, Milwaukee, was elected president of the company, which is a reorganization of the Allis-Chalmers Co., by the committee.

OBITUARY

Joseph M. Butler, secretary and treasurer of H. Koppers Co., Chicago, died Mar. 23, in that city. For a number of years Mr. Butler was prominently identified with the manufacture of iron and steel, largely in the Mahoning valley. Just prior to the formation of the Republic Iron & Steel Co., he was secretary of the Brown-Bonnell Iron Co., at Youngstown, and went to Chicago when the Republic offices were first established there. He was a nephew of Joseph G. Butler, Jr., of Youngstown.

Henry L. White died at Cañon City, Colo., Mar. 24, aged 63 years. He was born in Misouri and was one of the pioneers, going to Colorado in 1866. He had lived in Denver, and had owned mines at Leadville and Cripple Creek at different times.

SOCIETIES

American Society of Mechanical Engineers—It is announced that the spring meeting will be held May 20-23, in Baltimore.

Australian Institute of Mining Engineers—At the annual meeting in Melbourne, Victoria, Jan. 31, the following officers were chosen: President, James Hebbard; vice-president, H. C. Bellinger; council, R. S. Black, C. D. Delprat, H. W. Gepp, Richard Hamilton, Stanley Hunter, A. S. Kenyon and A. H. Merrin. The annual report showed a substantial addition to the list of members.

International Mining & Metallurgical Congress—One of the largest of the great scientific and industrial congresses is to be held in London in the early part of June, 1915. This is the sixth international congress of mining, metallurgy, applied mechanics, and practical geology. These congresses take place at intervals of five years, and the last was held at Düsseldorf in 1910. An influential committee has been formed to make the necessary arrangements, and the movement is being actively supported by the leading technical institutions of Great Britain.

University of Arizona—About 20 men of the faculty, senior class, visiting managers and engineers, participated in a two-day miners' conference at the university in Tucson recently. The conference was given up to a discussion of the relation of a collegiate training to the development of successful mining engineers, and a general discussion of the mining operations in Arizona and northern Mexico. The advisability of a short course for miners and prospectors, to be given during January, was also discussed. The conference resulted in the formation of the Arizona Mining Engineers' Society, the charter members being the School of Mines faculty, the senior class, managers, engineers and others interested in mining in Arizona. After the conference the company examined the equipment of the School of Mines, the new dry concentrator installed for experimental purposes being the chief attraction.

INDUSTRIAL NEWS

The McKiernan-Terry Drill Co., on Apr. 7, will remove to new offices in the Woolworth Building, New York.

The Teziutlan Copper Co. has ordered two more of the largest size of Hardinge pebble mills, to be equipped with the improved type of iron lining.

To protect metal stacks from the harmful effect of moisture and fumes, the H. W. Johns-Manville Co., Cleveland, Ohio, recommends the use of "vitribestos" stack lining. This material keeps the metal cool and having no exposed iron parts, presents a solid interior surface which is impervious to moisture and unaffected by the gases, fumes and acids of combustion. Vitribestos is also supplied in sheets for lining vaults and boiler-room ceilings.

Phelps, Dodge & Co. have recently purchased two 1000-hp., two-stroke-cycle, four-cylinder Carels-Diesel engines for installation at one of their Arizona mines. These are said to be the largest engines of the Diesel type in this country. They will be direct-connected to 60-cycle alternators to operate in parallel, and are guaranteed to deliver 1000 hp. at an elevation of 6500 ft., using not more than 0.48 lb. of oil per brake-horsepower-hour.

Directors of the International Steam Pump Co. have passed the quarterly dividend of 1½ per cent., explaining their action as follows: "Business conditions since the beginning of the calendar year have been of a disappointing nature. Volume of new business has decreased, and prices obtainable for our machinery have declined. Demand for our classes of machinery has not been equal to the present equipment of manufacturers throughout the country. No new competition has arisen, but existing competition is, if any-

thing, sharper than at any time in the history of the company."

Mussens, Ltd., 318 St. James St., Montreal, Canadian agents for the Hardy Patent Pick Co., of Sheffield, England. Bulletins. Hardy-Simplex Steam Hammer Drill and Hardy-Simplex Air Hammer Drill. Illustrated, 8 pages each, 6x9 in. These plugger drills are new models resembling previous types in the automatic rotation of the steel. This rotation is effected by means of a rifle bar and a ratchet wheel situated at the rear of the machine, in combination with a number of straight grooves cut in the piston or hammer, working through a steel guide nut situated in the chuck or drill holder. All parts of the rotation device are of hardened steel, readily renewable. The handle of the steam-actuated drill is covered with a special asbestos preparation under rawhide and does not get too hot to handle, while a special exhaust throws the steam away from the operator.

Isbell Mining Machinery Co., Los Angeles, Calif., Bulletin No. 3. Illustrated, 12 pages, 8x10½ in. This bulletin describes the Isbell Universal concentrator, which is designed to treat an unclassified pulp finer than 8-mesh, save mineral that will pass 200-mesh, and produce clean concentrates and tailings. The surface of the table is riffled, with the riffles converging from the sides to the center, in which are situated cutouts or traps for drawing off the valuable mineral, through discharge pipes, as it segregates under the jigging action of the concentrator. The points of advantage emphasized are: A well distributed working area; a gentle movement of the settled material and flow of it over the riffles from the top; the early withdrawal of the valuable minerals as they segregate; and the many repetitions of the treatment without danger of again washing the concentrates into the field. The capacity is stated to be from 50 to 150 tons per 24 hours, depending on the size of feed and the inclination of the deck of the table; one horsepower is sufficient for the operation of the table.

TRADE CATALOGS

The Dorr Cyanide Machinery Co., Denver, Colo. Catalog No. 5. Dorr classifier, continuous thickener, agitator. Illustrated, 36 pages, 6x9 in.

Edgar Allen American Manganese Steel Co., McCormick Building, Chicago, Ill. Bulletin No. 57. Stag brand manganese-steel sheaves. Illustrated, 16 pages, 6x9 in.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penn. A pamphlet describing "Micarta," a new material made primarily for insulating purposes but finding other applications as a substitute for built-up mica, hard rubber, hard fiber, glass, porcelain, asbestos, rawhide, etc.

Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill., Bull. 126, describes and illustrates different types of compression or squeeze riveters which are designed for use where the riveting to be done is more or less uniform and accessible and where it is done in large quantities. Bull. 129 deals with hose, hose-couplings and hose-clamp tools.

The Denver Engineering Works Co., Denver, Colo. Bulletin No. 1059. Richards pulsator classifier, launder type. Illustrated, 8 pages, 8x10½ in. The classifier described is intended to be bolted to the bottom of the mill launder that carries the pulp to the concentrating tables. It is a single-compartment classifier, and the pulp for each table is drawn through one of these classifiers. The classifier operates by a pulsating current, the classification being done under hindered-settling conditions. No screens are used. The classifier is intended for both large and small mills where a cheap but efficient classifier is desired.

Power & Mining Machinery Co., Cudahy, Wis. Bulletin No. 16. Converters. Illustrated, 32 pages, 6x9 in. This bulletin describes the converters built by this company and a complete line of appliances for use in connection therewith. Of particular interest are the Great Falls vertical type converters, which are being used so extensively with basic lining in recent plants. The air is introduced near the bottom of the converter through individual-type tuyeres, easily removable and fitted with Shelby hinged-flap valves. Barrel-type converters are also illustrated, together with various accessories, such as casting conveyors, hydraulic accumulators, etc Among the important copper plants to which the company has supplied converters are: Copper Queen, Canadian Copper Co., six plants of the American Smelting & Refining Co., Cananea Consolidated, United Verde, Granby Consolidated, International Smelting & Refining Co., Detroit Copper Co., Cerro de Pasco, Rio Tinto, and Great Cobar, Limited.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

SCRAPER for Placer Mining. Isaac N. Henness, Moclips, Wash. (U. S. No. 1,054,410; Feb. 25, 1913.)

SEPARATOR—Mineral Separator and Classifier. Lewis B. Skinner, Denver, Colo. (U. S. No. 1,054,799; Mar. 4, 1913.)

PURIFYING COPPER, A Method of. A. G. Sundberg, Helsingborg, Sweden. (Brit. No. 4692 of 1912.)

AMALGAMATOR. Samuel Whelpley Merrick, Madison, Wis. (U. S. No. 1,055,777; Mar. 11, 1913.)

CRUSHING—Liner for Grinding Mills. Alexander Rankine Globe, Cobalt, Ont., assignor of one-half to John G. Mueller, Cobalt, Ont. (U. S. No. 1,055,395; Mar. 11, 1913.)

BLAST FURNACE. Francis J. Zippler, Avalon, Penn. (U. S. No. 1,055,589; Mar. 11, 1913.)

BLAST-FURNACE CHARGING APPARATUS. James Warner Shook, Holt, Ala. (U. S. No. 1,055,671; Mar. 11, 1913.)

BELT CONVEYER of Flexible, Rolled Sheet Metal. Bengt Adam Afzelius, Sandviken, Sweden, assignor to Sandvikens Jernverks Aktiebolag, Sandviken, Sweden. (U. S. No. 1,055,591; Mar. 11, 1913.)

DRILL—Miner's Drill—William Channon, Des Moines, Iowa. (U. S. No. 1,055,608; Mar. 11, 1913.)

DRILL SUPPORTS—Improvements in Supports for Mining Drills. Ingersoll-Rand Co., New York. (Brit. No. 12,612 of 1912.)

DRILLING—Manual Coal- and Rock-Drilling Machine. Theophilus, David, Thomas, Stephen, Benjamin, and William Lippiett, Tredegar, England. (U. S. No. 1,054,925; Mar. 4, 1913.)

MINE LOCOMOTIVE (GASOLINE). William C. Whitcomb, Rochelle, Ill., asignor to George D. Whitcomb Co. (U. S. No. 1,055,846; Mar. 11, 1913.)

ORE CAR with Dumping Mechanism. George E. Truax, Inglewood, Calif. (U. S. No. 1,055,575; Mar. 11, 1913.)

SURVEYING—Mining Transit. William A. Berger, Boston, Mass. (U. S. No. 1,055,309; Mar. 11, 1913.)

DREDGES — Discharge Pipe for Hydraulic Dredges. Arthur W. Robinson, Montreal, Que. (U. S. No. 1,055,417; Mar. 11, 1913.)

ORE AGITATOR. Arthur W. Warwick, Colorado Springs, Colo., assignor to Archibald C. Shenstone, New York, N. Y.; Joseph N. Shenstone and Eva M. Shenstone, executors of said Archibald C. Shenstone, deceased. (U. S. No. 1,054,629; Feb. 25, 1913.)

SLAG—Method of and Apparatus for Handling Slag and Similar Friable Material. David T. Croxton, Cleveland, Ohio. (U. S. No. 1,056,632; Mar. 18, 1913.)

DRILL—Pressure-driven Drill. Alphons L. Westrich, Salt Lake City, Utah. (U. S. No. 1,055,844; Mar. 11, 1913.)

DRILLING — Improvements in Core-Drilling Machines. Manhattan Drilling Co., New York. (Brit. No. 11,583 of 1912.)

DRILLING CABLE. Thomas Gore, New York, N. Y. (U. S. No. 1,055,326; Mar. 11, 1913.)

DRILLS—Device for Removing Stuck Drills. Frederick Paul, Hastings-upon-Hudson, and Charles C. Mitchell, Millbrook, N. Y. (U. S. No. 1,055,790; Mar. 11, 1913.)

GATE FOR SHAFTS—Automatic Gate for Mine Elevator-shafts. Millsome W. Harvey, Sykesville, Penn. (U. S. No. 1,055,633; Mar. 11, 1913.)

CONCENTRATING TABLE — Pan-Motion Concentrating Table. Karl Senn, Alameda, Calif. (U. S. No. 1,056,305; Mar. 18, 1913.)

CONCENTRATOR. Arthur R. Wilfley, Denver, Colo. (U. S. No. 1,056,388; Mar. 18, 1913.)

RETORT FURNACES—Improvements in or Relating to Retort Furnaces or the Like having Upwardly Vertical Retorts. Stettner Chamottefabrik A. G., Stettin, Germany. (Brit. No. 19,097 of 1912.)

ROASTING—Ore Roaster. George A. Stanton, Placerville, Calif. (U. S. No. 1,056,376; Mar. 18, 1913.)

SLIME TREATMENT—Process for Treating Ores. Carl Schick, Siegen, Germany. (U. S. No. 1,055,495; Mar. 11, 1913.)

PERCUSSIVE APPARATUS—Process of Operating Percussive Apparatus, Especially Drills, Hammers and Ore Stamps. Hans Charles Behr, Johannesburg, Transvaal. (U. S. No. 1,055,857; Mar. 11, 1913.

AMALGAMATOR. Gustave A. Gelien, San Francisco, Calif. (U. S. No. 1,056,986; Mar. 25, 1913.)

CYANIDING—Apparatus for Separating Solids from Liquid Solutions. Lamartine C. Trent, Los Angeles, Calif. (U. S. No. 1,056,233; Mar. 18, 1913.)

EXTRACTION—Process of Extracting Precious Metals from Their Ores. Sidney Williams, San Francisco, Calif. (U. S. No. 1,056,311; Mar. 18, 1913.)

GRIZZLY. Mitts Quenner, Nogales, Ariz., assignor to Quenner Dry Crusher Co., Douglas, Ariz. (U. S. No. 1,056,829; Mar. 25, 1913.)

PLACER MINING—Apparatus for Collecting Precious Metals. Lawrence B. Gray, Boston, Mass., assignor to Hydraulic Vacuum Dredging Co., Wilmington, Del. (U. S. Nos. 1,056,662 and 1,056,663; Mar. 18, 1913.)

FERROALLOYS—Electric Furnace for Melting and Liquefying Ferro-Alloys. Wilhelm Schemmann and Jegor Bronn, Rombach, Germany, assignors to Rombacher Hüttenwerke, Rombach, Germany. (U. S. No. 1,056,546; Mar. 18, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Mar. 27

The Calaveras Smeltery Will Not Be Closed Down, as has recently been reported. J. H. Trerise, manager of the smeltery at Copperopolis, states that a small leak in a furnace caused temporary shutting-down of a portion of the plant. About 300 tons of ore is being smelted daily and shipments amount to about 50 tons per day.

Suit to Set Aside a Dredging Contract has been brought against Lawrence Gardella by C. S. Mahle because of alleged failure to pay the royalty for March. The contract was made in November, 1909, for the dredging of 100 acres on Honcut Creek, for which Gardella was to pay $800 at the beginning and $400 per month until the 100 acres is completed. The rate of $200 per acre was agreed upon for dredging any lands of the plaintiff in excess of the 100 acres.

The Dry Creek Débris Suit against the large mining companies on the Mother Lode has been temporarily withdrawn under stipulation that the mines will satisfactorily take care of the tailing from the mills. The suit was brought by the Valley Farm & Stock Co. and 26 other land owners against the Zeila, Kennedy, Argonaut, Bunker Hill, Original Amador, Fremont, South Eureka and Central Eureka. The lands claimed to be damaged by the débris coming from the streams choked by tailing are in Amador, Sacramento and San Joaquin Counties. The agreement extends to December, 1914. The South Eureka has already built a flume and ditch plant for handling tailing and the Kennedy has a wheel plant in course of construction.

Those Proposing to Make Pipe Lines Common Carriers in California are deriving some encouragement from the ruling of the Interstate Commerce Commission regarding the transportation of oil in other parts of the United States. The law is applicable to any corporation that transports oil by pipe lines or partly by pipe line and partly by railroad, or partly by pipe line and partly by water. California oil does go into other states partly by pipe line and partly by water and also partly by pipe line and partly by railroad; and the commission maintains that federal regulation may not be avoided by vesting title to the line in each state in a different corporation. But federal regulation has demanded the dissolution of trusts, such as the Standard Oil Co., and that trust or corporation must act under a separate name in each state, and if one of these separate corporations is not to be permitted to transport oil and **sell** it to another separate corporation while its pipe line is not employed as a common carrier it is difficult to see how it can do so if its pipe line shall be made a common carrier. Another feature of the ruling is that the commission says that it is not the rule that the pipe lines exercise the right of eminent domain, that they shall be held to be common carriers, but rather because they are common carriers they may be granted the right of eminent domain; and the commission further holds that a corporation once acting as a common carrier can not evade the federal regulation by transferring the interstate portion of its property to another corporation that is not a common carrier in the state in which it operates. But the commission favors the pipe lines in two points. When the pipe line is laid wholly or in part along the public highway after obtaining rights by purchase from owners of abutting lands no obligations as common carriers are imposed; nor does the fact that a pipe line is laid along the right-of-way of a common-carrier railroad impose any common-carrier obligations on the pipe line. These points are favorable to California pipe lines. There is no question that the oil pipe lines in California should by moral right be compelled to act as common carriers; but it is questionable if under the existing legal conditions they can be compelled by legislative action at Sacramento.

DENVER—Mar. 28

Snow Still Hinders Prospecting in Eagle County, there being 3 ft. of snow in many places, but in spite of this prospecting is being attempted and several strikes are reported. Ore richer than that found at the Lady Belle is said to have been found at a distance of six miles from the original discovery The owners of the Lady Belle are awaiting the disappearance of the snow in order to build a road from the mine to the county road, a distance of about 1000 ft. Then a carload shipment will be sent out for a test, and until the results are received the owners will refrain from making any further statements regarding the grade of the ore on the Lady Belle claim.

The Inadequate Appropriations by the Legislature for promoting the mineral industry of the state, was the subject of recent discussion at a convention of the Denver branch of the American Mining Congress. In the course of the discussion it was brought out that not less than 87% of the freight tonnage hauled by the railroads and originating in Colorado, comes from the mines. Figures from three of the leading railroads of the state are: Denver & Rio Grande, 92%; Colorado & Southern, 94%, and Colorado Midland, 87%. Furthermore it was stated that during the last five years the average yearly appropriation for agriculture was $130,000, the total for the period being $657,000. In the same period there was appropriated for mining purposes only $58,000, or an average of less than $12,000 per year. It was stated that the appropriations for the maintenance of fisheries in the last 10 years were eight times as great as the appropriations for the mining industry; in fact it has been only in the last six years that any appropriation at all has been made.

A Suit over Tailings Disposal is now imminent in the Uncomphagre Valley and threatens to be similar to the suit of the Telluride Power Transmission Co., against the Suffolk Mining Co., of San Miguel County, which was in the courts for 10 years before a decision was handed down. The suit is threatened by the farmers of Ouray County, who wish to compel the companies operating mills, to impound the tailings, which at present are claimed to be causing damage to the farm lands farther down the streams. The farmers seemed disposed to settle the matter amicably, but threaten legal proceedings unless something is done to alleviate the nuisance. The mill owners indicate their willingness to impound the tailings and settle the coarser sand, which seemed to do the most harm, but point out the impossibility of settling the fine slime. They also show the futility of impounding tailings in winter, as the mass freezes and at the first big thaw would turn to mud and be more detrimental than at present. The Atlas and Camp Bird will attempt to impound the bulk of their tailings, but claim that the slime cannot be removed from the water, and mining men believe that a strict enforcement of the law would compel the suspension of mining operations. In view of the fact that the mines have paid an average of 59.9% of Ouray County's taxes during the last nine years, against 10.6% paid by the farmers, the latter can scarcely afford to shut down the mines, thereby losing their best market and doubling their taxes. In all probability a compromise will be effected.

SALT LAKE CITY—Mar. 28

Seven Utah mines paid dividends in February. These were the Chief Consolidated, Eagle & Blue Bell, Gold Chain, May Day, Moscow, South Eureka and Yankee Consolidated. During 1913 thus far, Utah mines have distributed $1,548,700 in dividends.

A snow survey is proposed by A. H. Thiessen, section director for the local weather bureau, to be made of the cañons above the watersheds of the state to determine how much snow water is stored in the mountains. Such surveys in regard to the depth, density of the snow, etc., have been conducted in Maple Creek Cañon in the past. There is about 16% more water stored in these hills than at the same time last year, and the snow is also deeper in other places. There promises to be an abundant water supply for the coming season.

BUTTE—Mar. 26

A Shaft Will Be Sunk by the Corbin Copper Co. upon the recently acquired property in the Butte district. These claims are a short distance west of the Gagnon mine of the Anaconda company and are believed to contain an extension of the Parrot vein. The first work will consist of sinking to a depth of 1500 ft. T. A. Varden, superintendent for the Corbin Copper Co., will have charge of operations, and to facilitate the work will establish his headquarters at Butte, leaving T. A. Tregoning in charge of the operations being conducted at Rochester on the copper property which the company took over at that place several months ago.

Oil at Bozeman Hot Springs is indicated by surface conditions. The tract of land known as Bozeman Hot Springs and also the land adjoining shows evidence of the existence of oil underlying the territory. The substance as first discovered had the appearance of crude oil, and upon being chemically investigated was found to contain 27% illuminating oil and 60% lubricating oil, the remaining 13% being residue. Upon receipt of this report a more careful investigation was made with the result that indications of oil were found on several farms adjoining the Springs tract. Some Bozeman citizens have formed a company to exploit the oil lands. They have raised among themselves money which will be used in boring a hole 1000 ft. deep at a point to be decided upon later, between Middle Creek and the West Gallatin River.

NEGAUNEE, MICH.—Mar. 28

The Balkan Mining Co., a new corporation, has been formed as a subsidiary to Pickands, Mather & Co., in the Iron River district. The company will explore the three "forties," lying just west of the Chatham mine, and owned principally by W. H. Sheldon. The Duluth Diamond Drill Co. will drill the land on contract. The three "forties" lie south of the Wickwire mine and north of the Hiawatha. Iron formation is known to exist there. Pickands, Mather & Co., under the name of the Verona Mining Co., is the largest operator in the Iron River district.

The Quinn vs. Tully Lawsuit, embracing ownership in the fee of the Tully mine, at Iron River, has been decided by the state supreme court in favor of the complainant, J. H. Quinn, of Ishpeming, reversing the decision of Judge Cooper, in the lower courts. The case has attracted considerable attention on the Michigan iron ranges, because the opposing parties are well known in the district, and because an important principle was involved, namely the question of verbal agreements in mining transactions. Briefly, the case was as follows: In 1902, Mr. Tully, a resident of Iron River, invited Mr. Quinn, of Ishpeming, to join him in looking over promising iron-ore lands in the Iron River district, with a view of interesting mining companies. Mr. Quinn, who had had experience in turning over mineral properties, made several trips to Iron River, and the two men examined the Baker and Tully lands, now the Baker mine and Tully mine. They secured an option on the Baker property, and after two mining companies had taken over the option and abandoned it, a third company, Corrigan, McKinney & Co., found sufficient ore to make a mine. For promoting the Baker lease, Mr. Tully and Mr. Quinn received an advance royalty of 6c. per ton of iron ore shipped, of which each partner received 3c. While the Baker property was being explored, Mr. Tully secured an option on the adjoining 80 acres, now known as the Tully mine, without notifying Mr. Quinn. Under the name of the Tully Mining Co., Mr. Tully finally succeeded in getting Corrigan, McKinney & Co. to take a sublease on the Tully property, on which a large orebody was later proved, and secured for himself an advance royalty of 6c. per ton, of which 3c. had to be transferred to Judge Flannigan for lawyer's services in clearing the title. In 1903, before Corrigan, McKinney & Co. had taken over the option, and when another mining company, which later abandoned the sublease, was exploring the Tully land, Mr. Quinn notified Mr. Tully that he was entitled to a half interest in the advance royalty, which Mr. Tully denied. Mr. Quinn claimed that at the time he and Mr. Tully examined the lands it was agreed that they were to have equal shares in any options that might be taken, and also that he particularly advocated getting an option on the Houlihan land, or Tully, as it is now called. Exploration has since proved that the Tully mine has an orebody estimated at from 3,000,000 to 5,000,000 tons, being a much larger mine than the Baker. Mr. Quinn's share will consist of half of Mr. Tully's advance royalty and will amount to 1½c. per ton. The suit was begun three years ago, and the court has had its decision under consideration for more than a year.

JOPLIN, MO.—Mar. 28

Abnormal Influx of Water Has Caused Closing of Mines, especially along Short Creek and Shoal Creek in the Galena district in Kansas. This is due to the unusually heavy rainfalls early in the week. As far as water conditions are concerned the operators are facing one of the most difficult situations that has been presented for several years. In certain parts of the district many operators had just succeeded in unwatering their properties and were preparing for full-capacity production when the floods came, making it necessary to drain the mines again. The sheet-ground mines near brooks and small streams naturally suffer the most.

LEWISTON, IDAHO—Mar. 18

Storage-Battery Motors Will Be Tried Out in the Bunker Hill mine, in the Cœur d'Alene district . Low-hung trolley wires have caused many accidents, and the storage-battery motors are being tried with the hope that, if they prove practicable in moving a large tonnage of ore, this menace to miners may be removed. Should the motors prove adaptable, other companies using electric power will probably follow the lead of the Bunker Hill.

The Oregon Short Line Is Surveying a Cutoff from Buhl, Ida., to Wells, Nev., to save moving freight through Salt Lake City and Ogden. This proposed line would shorten the distance between Idaho and California points about 200 miles and would give the Twin Falls country a main outlet for its products. In Nevada the railroad would run through some of the new gold and copper camps and would increase mining activity in northern Nevada. Wells is on the main line of the Southern Pacific, and the surveys are being made so that when the Union Pacific and Southern Pacific dissolution question is settled, work can be started at once.

Hydraulic Stripping is to be applied at the Iron Crown mine, in the Newsome district. This method of removing the weathered material from the surface of veins is rapidly being adopted where conditions are favorable. In California it was used at one mine to remove the worthless material preliminary to open-cut mining on the underlying vein. In Cobalt it was used to lay bare the ground in order that any outcropping veins might be discovered, although the larger part of the ore in those veins would be removed by underground and not by open-cut mining. In Minnesota, the method will be tried this season in stripping iron-ore formation on the Cuyuna Range. At the Iron Crown the débris is in such physical condition and contains enough gold to make it worth while to wash the material through sluices.

In the Region of the Snake River above Lewiston, a small mining industry is growing up. Access to this country is gained by the river, on which a twin-screw gasoline boat is now used for towing freight above Lewiston. A cement plant is being built at Asotin, Wash., on the Snake River, for the Idaho Portland Cement Co., by the Inland Engineering & Construction Co., of Kansas City, Mo. L. Clyde Wilson is superintendent. About 10 miles above Asotin, some free-milling gold ore has been found at a depth of 400 ft. At the Anaconda property, which is 10 miles still farther up the Snake River, and one mile above the mouth of the Grande Ronde River, some rich gold ore has been struck by Ollie Sloan, who has worked on the claims all winter. The Great Eastern Copper Co. uses a boat to send ore down the river, a shipment of about 200 tons now being on the way down to Lewiston en route to the Tacoma smeltery. A new town, known as Rodgersburg, has just been started at the mouth of the Grande Ronde River; all supplies are brought in from Lewiston by boat. Steel for the cement company's plant is now being taken up the river. This company owns a large deposit of limerock and clay which will be used in the manufacture of portland cement. In the country around Rodgersburg, deposits of coal are known and attention is just beginning to be turned to the possibilities of their development. Much is being said about the building of a railroad to follow along the Shale River, but as yet nothing definite has been planned.

FAIRBANKS, ALASKA—Mar. 2

The White Pass & Yukon Ry., according to statements made by officials of that company, will make a strong bid during the coming season for a portion of the freight traffic on the Alaskan part of the Yukon River and its tributaries. This means that the company will come into active competition with the Northern Navigation Co., a subsidiary of the Northern Commercial Co. There has long been a tacit agreement between the two carrying companies whereby the American company should have the Alaska trade to itself, while the White Pass enjoyed a monopoly on the Canadian side of the boundary. In the summer of 1911, the Northern Navigation Co. broke into the Dawson trade, and the present move of the White Pass company is in the nature of a reprisal. A contract has been let for the construction of two new boats. The American company handles its freight by way of St. Michael and the lower Yukon, which makes an all-water route. By the White Pass, the freight is shipped by rail from Skagway to Whitehorse, where it is loaded on the river boats. The White Pass officials are confident that they cannot only compete with the Northern Navigation Co. in midsummer, but that they can land freight in Fairbanks earlier in the spring and later in the autumn. The rate on miscellaneous freight, except machinery, from Seattle to Fairbanks has been $60 per ton in the past, but it is announced that the Northern Navigation Co. will cut this to $50 during the coming summer.

THE MINING NEWS

ALASKA

Fairbanks District

EMPIRE—The Willis mill recently completed the crushing of 14 tons of ore from the Foster-Hungerford lease on this group of claims, on the left limit of Chatham Creek. The ore was taken out in sinking the 50-ft. shaft and returned about $40 per ton.

NORTH STAR—Willis, Carlson, Rodset & Larson, who for several months have been prospecting for the Gladstone vein where it was lost at a fault, have resumed work on this group, which they hold under lease. The vein is developed by a 100-ft. shaft and 150 ft. of drifts. There is a 5-stamp mill on the property.

RHOADS-HALL—The electric pump installed last autumn to raise the water in the winze has been found to be unsuitable. It is too small and was not designed for sinking. A No. 5 Cameron sinking pump will be installed at once, and sinking in the winze will be resumed. Sufficient ore has not been available to keep the mill operating continuously during the last few months.

RELIANCE MINING CO.—This company has been incorporated for $1,000,000 under the laws of Arizona. The principal stockholders are Captain Spalding, Luther Hess, Henry St. George and Ray Drumbaugh, of Fairbanks. The holdings include the Soo, Waterbury and Wild Rose claims, on the right limit of Dome Creek, about opposite Nine Above, creek claim. Three sets of lessees are working on these claims. At a recent cleanup by Spalding, Ronan & Cunningham, 80 tons of ore from the Soo vein returned 60 lb. of amalgam, thought to be worth about $8000. As soon as more water is available, the lessees expect to keep the 2-stamp mill supplied with ore of a similar grade.

Juneau District

ALASKA-MEXICAN—In February, 17,598 tons of ore was crushed, yielding $32,086 in bullion and concentrate, or $1.84 per ton, $8763 being estimated as the net profit.

Valdez District

VALDEZ CREEK PLACER MINES—It is reported that progress is exceeding expectations; 100 tons of freight has arrived, including 1500 ft. of 14-in. pipe, three 4-in. giants and provisions for 40 men for the entire season of 1913.

ARIZONA

Cochise County

COMMONWEALTH—Contracts for the building of a 350-ton mill at this property, at Pearce, have been let. Campbell & Kelly, of Tonopah, who built the framework of the Belmont mill, were the successful bidders.

DEVELOPMENT COMPANY OF AMERICA—The Equitable Trust Co., of New York, as trustee, under a first-mortgage collateral trust indenture of this company, will sell the stocks deposited with it at Jersey City, Apr. 17. The indenture was originally held by the Eastern Trust Co. as trustee, to which the Equitable Trust Co., of New York, is the successor, under the mortgage and secured an issue of 15-year collateral trust 6% bonds. The property to be sold includes 400,000 shares of the Tombstone Consolidated Mines Co., Ltd.; 135,000 shares of the Poland Mining Co.; 500,000 shares of the Congress Consolidated Mines Co., Ltd.; 250,000 shares of the Imperial Copper Co., and $2,211,340 in certificates of indebtedness of the Poland Mining Co.

Gila County

SURVEYS FOR THE ELECTRIC ROAD FROM GLOBE TO MIAMI are now being made, preliminary to final location.

Mohave County

MIDNIGHT—The recent shipment of a carload of concentrates has demonstrated that a profit can be derived from operating the mine and mill, and the owners have decided to continue operations.

SONOMA—Stopes are being opened up on the 100-ft level preparatory to making regular shipments. This property was abandoned many years ago, but systematic prospecting has proved the existence of considerable ore.

COPPER GIANT—This group with several surrounding claims has been bonded to William Neagle, of Jerome, who is representing the Clark interests. A large force of men is to be put at work within 30 days, and shipments to Jerome will be begun as soon as possible.

AMERICAN METALS MINES—The shaft on this Deluge Wash property has been sunk to a depth of 50 ft. where work was stopped on account of the large flow of water. Near the bottom of the shaft a crosscut was driven into the vein and 8 ft. of ore was disclosed carrying lead, zinc, copper and some gold and silver. A pump and hoist will be installed within a few weeks; Mr. Cornelius is in charge.

Pima County

OCEANIC—A new strike of ore, 5 ft. wide, was made recently in the lower levels.

SIBLEY—The Sibley and Last Chance groups in the Tucson mountains have been bonded to Dr. Striker, of Los Angeles.

Santa Cruz County

INTEREST HAS BEEN AROUSED IN THE RED ROCK COUNTRY by the finding of copper ore east of Harshaw. It is a porphyry deposit and has been stripped for a width of 200 feet.

IVANHOE—A strike of high-grade silver ore has been made on the 200-ft. level. F. D. Valles is superintendent.

CRESCENT COPPER CO.—Ore has just been cut by the crosscut at 800 ft., and is reported by the owners to be chalcocite.

TRENCH—This mine is now equipped with machinery for sinking, and it is expected that the shaft will be sunk to a depth of 500 ft.

CONNECTICUT—Hogan & McCutcheon will ship another carload of ore from this mine at Alto. A rich strike has been made in the new winze.

AMERICAN BOY—This mine will ship as soon as freighters can be found to transport the ore to the station. It is owned by Peterson, Clarke & David.

BLUE LEAD—Under the supervision of Kellogg & Crawford, this mine is entering the shipping class, and already has several carloads of ore ready for hauling.

WILD CAT—Roy Stump, one of the owners of this mine in the Santa Rita mountains, reports that the crosscut has cut through 65 ft. of copper ore in the big vein.

GOLD NUGGET—A group of four claims has been bonded for one year by John Allen to P. J. McCarthy with a working agreement. Good ore has been taken out of the vein.

R. R. R.—A new Sullivan air-compressor, air drills, and a 65-hp. Fairbanks gasoline engine have been installed and an effort will be made to maintain shipments at 125 tons per day.

HARRISON—This group has been leased to Fessler, Ewing & Crittenden, and ore is being taken out for shipment, but like all other shippers around Patagonia, they are handicapped by the lack of burros and teams.

PRINCE RUPERT—Henry White has taken an option on this group from Harry Barnett and is now installing a gasoline hoist to sink the shaft. He expects to sink to 500 ft. on the vein which runs parallel to the Mansfield veins. The surface ore is good.

MAMMOTH—This group owned by Richardson, Crepin & Shultz has been bonded to Clement Guion, with the agreement that work shall begin before Apr. 1. This group covers the easterly extension of the Montezuma vein, owned by the McCormicks, and is on the road from Patagonia to Alto.

Yavapai County

NELSON MINING CO.—The driving of the proposed new crosscut tunnel has been sanctioned by the stockholders and work will begin at once.

CASH—Eastern stockholders recently visited the property and made arrangements for the resumption of work through the Senator tunnel.

MONTE CRISTO—The ore already blocked out is 330,000 tons. The company will begin experiments soon to determine the flow sheet for a new mill which the company proposes building.

BEST FRIEND—The new shaft which has reached the 150 level has struck water in small quantity. A crosscut shows the vein to be 40 ft. wide. The ore contains a good percentage of copper.

CALIFORNIA

Amador County

KEYSTONE—It is expected the inclined shaft will reach a depth of 2600 ft. by the end of March. It will then be 1260 ft. deeper than the old workings. Crosscutting will be begun as soon as the stations are cut. This mine was reopened in January, 1912; the old shaft was retimbered and deepening was begun immediately. The work has progressed steadily. The mine is equipped with modern machinery and electric power. C. R. Downs, of Sutter Creek, is manager.

Calaveras County

UTICA CO.—At the Cross shaft and the Stickle mill, 200 men are now employed. The Gold Cliff mill and mine are also working regularly.

ANGELS—The waste water from the stamp mill will be used for irrigating the grounds of a recreation park being made by the town of Angels Camp.

DOLLING—It is reported that the 40-stamp mill, which has been idle for several months, will be put in commission to work on ore from the west drift on the 300-ft. level.

HEXETER TUNNEL—A cylinder-type gravel mill has been installed. The heavy boulders serve as crushers and the finer gravel passes through the screens. A trial test is reported to have handled 85 cars of gravel in 24 hr. The mine had been idle for several years. The present owner, Joseph Garbarini, drove the tunnel through the rim and found a sufficient deposit of pay gravel to warrant operation on a large scale.

Del Norte County

ORO DEL NORTE—The enlargement and improvement of the plant for saving gold and platinum is about completed, and operation will be resumed on a larger scale than formerly. Dr. Heintz, of Crescent City, is owner of the mine and inventor of the process. It is claimed that trials have been successful and commercial results are expected. A complete description of the plant has not been made public.

Kern County

STANDARD—This property has been leased to James Rice. The vein of high-grade ore in the Good Hope extends west and into the Standard. A shaft is being sunk and crosscuts will be driven to the vein. F. H. Morgan, of Redlands, is owner.

HOOSIER MINING & MILLING CO.—An engine and sawmill have been shipped from Bakersfield to this company's mine, near Democrat Springs. A stamp mill will be shipped from Los Angeles. H. B. Frank is superintendent.

CONSOLIDATED MINES CO.—The new 5-stamp mill installed at the Good Hope mine was put in commission, Mar. 3. This is the first plant in the Randsburg district equipped with electric power. The company owns claims that are being developed or which are producing, and there is a prospect that the number of stamps will be increased. The mill tailing will be impounded and subsequently be cyanided. The concentrates will be shipped to the Selby smeltery. Water for the mill is now furnished by the Randsburg Water Co., but the company has a water supply that may prove to be permanent, in the Wedge shaft. The water is 200 ft. deep in the shaft. It came in last September, and was the first water encountered in the mines of the district. An electric pump will be installed to supply the mill from the shaft and permit deepening the shaft from the present 550-ft. level. It is expected that greater depth will disclose more water. Economic saving of water is provided for by the installation of an iron settling tank connected with the mill. N. M. Kirkpatrick, of Randsburg, is superintendent.

Mariposa County

M. C. & M. CO.—This mill at Bagby recently treated 540 tons of ore mined by lessees, which returned $7300.

ORO RICO—An attachment has been secured by Albert E. Tower, of New York, in a suit against J C. Wilson, of San Francisco, for money alleged to be due on a promissory note for $25,500, and moneys earned by the mine, making a total of $170,680.

Nevada County

GOLDEN CENTER OF GRASS VALLEY is the name of a new mining company incorporated to mine in the town of Grass Valley. The old Dromedary shaft has been purchased. The capital stock is $300,000. The directors are C. A. Brockington, of Grass Valley; J. W. Howard, Rodney McCormick, J. C. Peterson, M. A. Nurse, W. H. Childers and D. A. Matheson, of Sacramento.

OUSTOMAH—Electrical-power equipment is being installed for operating the hoist, pumps and mill. An air compressor and drills are also being installed. The mine will be unwatered and the shaft deepened. It is expected to complete the installations by the middle of April. E. C. Klinker is manager.

GOLD CANYON—The mill, which has been idle for about one year, will be put in commission in April, and the small crew of men which did development last winter will be increased to 20. The ore is free-milling and carries sulphides. C. C. Derby, of Grass Valley, is reopening the mine under lease. The property is owned by the Two Counties Gold Mining & Milling Co. It is on the middle Yuba River.

San Bernardino County

TUNGSTEN IS REPORTED TO HAVE BEEN FOUND IN KELSO DISTRICT, about 55 miles northwest of Randsburg. Besides tungsten the ore is said to contain gold, silver and copper. The percentage of tungsten has not yet been determined, but samples are being assayed. Eight claims were located in one group by Frank Feldman and R. Roschl on a 7-ft. vein. The district is about 10 miles south of the town of Kelso on the San Pedro, Los Angeles & Salt Lake R.R.

Shasta County

QUARTZ HILL—A new 5-year lease on this mine has been taken by the Mammoth Copper Co. The mine was closed two years ago, because of an oversupply of quartz used by the smeltery for fluxing. It is said the company intends to mine 150 tons per day.

MOUNTAIN COPPER CO.—The old smeltery building has been razed. The smeltery was closed permanently six years ago, because of the persistent complaints of the farmers that the fumes destroyed their crops. At that time about 1500 men were employed at the smeltery and the mines, and Keswick was a town of 3000 population. The first of the smeltery buildings were built 19 years ago. The smelting of the Iron Mountain ores has for the last six years been done at Martinez, near San Francisco. The razing of the structure was accomplished by attaching a wire cable which encircled the building. The free end was coupled to three steam locomotives.

Sierra County

TIGHTNER—According to reports from Nevada City, shipments received, Mar. 2, bring the total amount of gold produced in the last four months to $250,000. This property was purchased by the present owners about a year ago, and is said to have been a large producer previous to that time; Lawrence Y. Wagner, superintendent.

Tulare County

STANISLAUS GRAVEL MINING CO.—The principal place of business has been removed from Porterville to San Francisco.

HIMALAYA MINING CO.—It is reported that this company, owning chrysoprase mines in the White River district, with principal place of business in New York, has filed a petition in voluntary bankruptcy. The liabilities are said to be $477,700. The corporation was financed by New York jewelers. The mines have produced some stones which were shipped to New York. J. E. Merrill, of Porterville, is superintendent. He is reported to have sued the company for unpaid salary.

COLORADO

Clear Creek County

MAMMOTH—Active operations at this East Argentine property have been resumed and a promising vein of silver ore is being developed.

GENEVA—This property on Alpine mountain is being developed by a crosscut tunnel which has been driven to a total length of 270 ft. The breast shows a well mineralized quartz vein the assay value of which is encouraging. William Aldred is manager.

BIG INDIAN—The vein on Leavenworth mountain has been intersected by the crosscut development tunnel, but the full width of the vein has not yet been determined. A drift will be driven northwest toward the shaft which was sunk in pay ore. E. J. Butts is manager.

KEY WEST—This property on Leavenworth mountain is being developed by a drift from the McKinney adit. Sinking is in progress on the McKinney vein 240 ft. from the portal of the tunnel. It is reported that the bottom of the shaft is in a vein of lead-zinc ore carrying gold and silver.

Conejos County

IN ORDER TO INVESTIGATE RECENT DISCOVERIES in Eagle County and in the Platoro district in the Southwest, an appropriation of $5000 has been asked of the house committee of the state legislature by the state commissioner of mines, Thomas R. Henehan, for use in employing two deputy commissioners.

Lake County-Leadville

THE ORE TONNAGE HAULED BY THE RAILROADS from the Leadville district was greater during the months of February and March than it was for the same months of 1912, and the Arkansas Valley smeltery has five furnaces in blast compared with three at the same time last year.

ROBERT E. LEE—Since the installation of the new electric hoist and the sinking of another lift of 25 ft. in the shaft, the lessees are in a position to ship one carload of zinc-carbonate ore per day.

LUZERNE—Lessees have for several weeks been at work on iron ore at one of the lower levels. Recently this iron was holed through and on the other side a streak of lead ore was found. This was followed and now it is several feet wide, carries a good percentage of lead and some silver. The ore is being hoisted and shipments will be made.

San Juan Region

BUTTERFLY-TERRIBLE—It is reported that this property, near Ophir Loop, will be reopened and operated by a leasing company of which John B. Olson is manager.

TOMBOY—The mill is treating from 380 to 400 tons per day. The ores from the Argentine and Montana properties are subjected to separate treatment. Many alterations and improvements are being made. The Frue vanners are being replaced by No. 6 Wilfley tables; the Richards pulsator classifiers have been discarded and replaced by Bunker Hill screens; Dorr settlers have been added to the equipment and improvements have been made in the filter plant. About 80% of the water is re-used. Three classes of concentrates are produced, all of which are dried at the mill before shipment. A surface tramway equipped with electric haulage transports the ore from the recently purchased Montana property to the mill. The same tram carried the concentrate from the mill to the Ophir Tunnel terminal of the wire-rope tramway to Pandora. All concentrates are trammed to Pandora and loaded directly into railroad cars without sacking. The new Bleichert tramway has practically eliminated the wagon naulage of ordinary mine and mill supplies. It is probable that the milling process will be supplemented by cyanide treatment in the near future. Hans Hanson is superintendent of the mill; D. A. Herron is general manager.

SMUGGLER-UNION—Drifting is in progress from the Mendota shaft toward the Una lode which will be developed by drifts from the intersection. The Una property is owned by the Moorhead Mining & Milling Co., and is held by the Smuggler-Union under bond and lease. Considerable development work has been undertaken to increase the large reserve of low-grade ore available for treatment in the recently remodeled concentrating mill and cyanide plant. The Sheridan mine has been reopened and a large force of men is employed. The Sheridan tramway has been placed in operation. In the Smuggler mill the old bumping tables have been discarded and replaced by Wilfley tables. The sand-wheel formerly used to elevate tailing has been replaced by air-lifts. Chilean mills have been replaced by Hardinge conical mills for recrushing. The cyanide plant has been remodeled and enlarged and is now designed to treat slime as well as sand. The vat capacity has been increased and some of the old sand vats have been converted into Dorr settlers; 45-ft. Pachuca agitators have been added to the equipment and Portland continuous filters have been installed. Further changes and improvements are under consideration which will greatly increase the efficiency of the plant. Walter Reed is superintendent of the cyanide plant.

Teller County—Cripple Creek

C. K. & N.—It is reported that the suit brought by the El Paso, against this company, over apex rights, will probably be settled out of court, and there is a possibility that the C. K. & N. will be included in the El Paso-Golden Cycle merger.

ELKTON—According to the annual report a mill may be built to treat the low-grade ore from this mine. It is stated that there is 10,000 tons of low-grade ore in the lower levels assaying about $17. A manager has not been appointed to succeed Mr. De La Vergne.

IDAHO

Bonner County

IDAHO-CONTINENTAL—About 12 or 14 carloads of machinery have been hauled from Port Hill, Idaho, to the property of this company, where a mill, is to be built and but one carload, which is in transit, remains to be delivered. A. Klockman is general manager.

LOUISIANA

Calcasieu Parish

UNION SULPHUR CO.—The State Board of Equalization, has won its suit to increase the assessment of this company. Litigation has continued for about two years and it is now agreed that the assessment shall be $7,500,000 for the mine proper, and $2,750,000 for the mineral and equipment above ground, making a total of a $10,250,000 assessment, which is practically double the assessment made by a local jury in 1911.

MICHIGAN

Copper

MAYFLOWER—Drill hole No. 28 started about a month ago has been abandoned owing to the breaking of the casing. A new hole, No. 29, has been started about 25 ft. west of the abandoned hole.

SUPERIOR—No. 1 shaft is down to the 20th level and the lower openings on the West lode continue satisfactory. The ore from this shaft now contains about 25 lb. of copper per ton. Developments at No. 2 shaft have been discouraging, but sinking continues and the shaft is nearing the 17th level.

SOUTH LAKE—The work of cutting out the station at the 300-ft. level is going forward and drifting in both directions will soon be started to open the Evergreen lode at that depth. This lode when cut in the shaft showed remarkable richness, and its further opening will be watched with interest. As soon as the drifts have been extended a short distance sinking will be resumed.

NEW ARCADIAN—The shaft at this property is being sunk at the rate of about 75 ft. per month and is now about 475 ft. deep. A station will be established and a crosscut started in each direction to reach the two parallel formations at a depth of 500 ft. The shaft is being sunk on the middle lode of a series of three, and as depth is obtained the character of the formation becomes more nearly uniform. The shaft does not follow the dip of the lode, but is being sunk at an angle and the lode comes into and dips out of the shaft from time to time.

Iron

FORBES—At this mine of Jones & Laughlin in the Iron River district the new brick and concrete change-house and the new office building have been completed.

ROGERS—The new boilers recently installed at this mine near Iron River are of the water-tube type contrary to general practice in the iron districts, but similar to installations at the Dober mine of the Oliver Iron Mining Co.

STEPHENSON—The Cleveland-Cliffs Iron Co. has installed an electric pump on the fifth level of this mine in the Gwinn district, and a launder 1¼ miles long built of 3-in. plank has been completed to convey the water to the Escanaba River.

McGREEVY STEEL CO.—The shaft at the Purcell is 200 ft. deep. A change-house and a permanent headframe are to be built. Two 100-hp boilers have been ordered, similar to those purchased for the Sheridan mine. At the Sheridan the boilers are being erected with concrete settings.

E. J. LONGYEAR CO.—Four more diamond drills have been put at work by this company which continues to explore in the Mastodon section of the Crystal Falls district, where the big "Mastodon find" was made. This makes 10 drills in operation there.

MINNESOTA

Mesabi Range

SECTION FOUR—The shaft is 65 ft. deep and hoisting and drilling machinery has been installed.

HULL-RUST—It is expected that this mine, of the Oliver Iron Mining Co., will be a heavy shipper this season.

MORRIS—This open-cut mine, near Hibbing, which has been closed for several years, will be operated this season. This mine was formerly a heavy producer.

MISSOURI

Joplin District

ONONDAGA—Operations are being resumed following the installation of gas engines and other needed improvements. The mine is a steady producer.

FEDERATED MINING & MILLING CO.—This company intends to consolidate two of its mills, the George H. and the Goodrich, into a single 300-ton plant, to be erected at a new sheet-ground mine near Prosperity.

GOPHER—A pumping plant with a capacity of 1700 gal. of water per min. is being installed at this mine near Duenweg. The pump is of water-works pattern, and will dispense with the services of two men. This is a sheet-ground mine that produces about 100 tons of concentrates per week.

HARDY MINES CO.—This company operating the old Eureka mill on a lease of the Crown Crest Lead & Zinc Co. land east of Duenweg has just begun operations. The concentrating plant has been remodeled and the capacity is now 150 tons. Ore is found from 110 to 135 ft. below surface, the ground being soft and requiring heavy timbering. A test run of 43 tons produced 6 tons of high-grade concentrate.

MATTES BROTHERS MINING CO.—Operations will be resumed at Jackson Hollow about Apr. 1 after a shutdown of several months when extensive repairs were made in the mill. A new tailing elevator has been installed as the tailings pile had grown to such proportions that an extension became necessary. There is 1000 tons of concentrate in the bins which is the largest and about the only ore reserve in the district.

O. F. & L. MINING CO.—This company, an old-time operator in the Duenweg district, has taken over the Newsboy lease on a portion of the Wilson Mines Co. tract and is moving the Brooklyn mill from the Hill land to the newly acquired lease. Mining has formerly been carried on at a depth of 135 ft. and the ore has been cleaned on hand jigs. The present operators intend sinking to 170 ft. and remodeling the mill to a capacity of 200 tons.

MONTANA

Butte District

DAVIS-DALY—The crosscut being driven on the 1900-ft. level of the Colorado workings intersected a new vein carrying 2 ft. of copper glance, Mar. 22. Recently a body of bornite ore was also opened on the 1400-ft. level of the Hesperus claim of this company, in a previously unexplored area. Since the recent change of management, W. L. Creden, consulting engineer for the Butte & Superior, and Butte-Duluth mining companies, has had charge of operations.

BUTTE & ZENITH CITY—The shaft is being sunk steadily by a force of 22 men in three shifts at this company's property, about three miles west of Butte. The shaft is 350 ft. deep, and will be sunk to the 500-ft. level before development work is started. As soon as this level is reached, which is expected to be by May 1, crosscutting both north and south will be started. Hard granite was recently encountered in the shaft, and numerous small stringers, lying between the veins, have been cut.

Broadwater County

LITTLE GIANT—Operations have been started by the Whitehead brothers, who own this mine in the Hassel district, and a carload shipment of ore will be made shortly. Preparations are being made for the installation of a cyanide plant to treat about 30,000 tons of ore on the dump, and the low-grade ore from the mine.

BLACKSMITH—It has been reported that Senator Charles Muffley and associates, have purchased this property, situated in the Hassel district, from the estate of the late Senator Thomas H. Carter. There is a large tonnage of ore blocked out in the mine, and on the dumps, and the new owners expect to replace the stamp mill by a reduction plant in which a new system of ore treatment will be used. The ore is refractory and could not be treated successfully by the stamp mill.

Fergus County

BARNES-KING—In February this company's mill at Kendall was operated continuously on ore from the Santiago mine, acquired by the company about a year ago . During the month 4000 tons of ore was treated, which yielded $10 per ton. All the ore was mined from the drift on the 500-ft. level, which has now reached a length of approximately 400 ft., the face still being in excellent ore.

Granite County

ROYAL BASIN—The copper leaching plant installed a few months ago at Maxville, is being operated successfully. The company recently shipped a carload of electrolytic copper.

Jefferson County

CORBIN COPPER—The new concentrator was recently completed, and is now treating about 250 tons of ore daily. The first shipment of concentrates has just been sent to the Washoe smeltery at Anaconda for treatment.

GOLDEN CURRY—Ore is being shipped daily from this property near Elkhorn to the Washoe smeltery at Anaconda and the East Helena smeltery. Recently a good wagon road was built from the mine to the ore bins at the railroad, greatly facilitating shipments.

NEVADA

Lyon County

MASON VALLEY—A contract has been closed for the installation of two stands of converters for the smeltery of this company at Thompson. The matte now produced is being shipped to the Garfield smeltery in Utah. A large hoist operated by compressed air has lately been installed at the winze, and ore is now being shipped from the next level below the No. 4 tunnel level. Jules Labarthe is manager.

Nye County

A NEW STRIKE IS REPORTED at Orizaba, near Cloverdale, which is 30 miles north of Millers. There are at present but few people in the vicinity and reports so far received give little information regarding the discovery.

SHIPMENTS in tons from Tonopah mines for February were as follows:

Tonopah Mining	13,921	North Star	....
Tonopah Belmont	11,960	Mizpah Extension	....
Montana-Tonopah	4,232	Jim Butler	1,887
Tonopah Extension	4,469	Tonopah Merger	655
West End	4,151		
Midway	380	Total	43,818
MacNamara	2,226	Estimated value	$886,010

White Pine County

ELY CONSOLIDATED—Operations at this property at Star Pointer have consisted of sinking a shaft to a depth of 600 ft., and driving numerous drifts, but little ore has been found and it has been decided to close the mine. The company recently took over on bond the old Mason mine in Elko County, and work has been commenced there

NORTH CAROLINA

Stanly County

SOUTHERN ALUMINUM CO.—Reports that have been published intimating that this company might abandon its plans for the erection of an aluminum factory at Whitney, N. C., are incorrect. Construction work is going right ahead, and the plans of the company have been enlarged rather than reduced. Dr. Heroult, who has been engineer in charge, retired several months ago. He was succeeded by M. Bunet a French metallurgist of extensive experience in the manufacture of aluminum.

OREGON

Baker County

NORTH POLE—This property is under option to Portland men; Albert Geiser, manager.

RED BOY—Work will be resumed under the management of John Farrell.

IBEX—It is stated that there is enough ore in sight to warrant building a mill. David Ross, manager for the Arthur Hill estate.

UNDERWOOD PLACER—Work will be started again, and it is hoped to have some of the giants working before the snow is gone from the mountains. The mine is near Cornucopia.

Coos County

WASSON BEACH PLACER—Satisfactory results were obtained at the first cleanup at this beach mine owned by Wasson Bros. Platinum was recovered as well as gold.

Curry County

ELLWOOD PLACER—This mine on Elk Creek is owned and operated by W. H. Ellwood, of Portland.

Josephine County

ORIOLE—Part of the new machinery recently ordered for this mine is on the ground and more is being hauled; J. C. Mattison, manager.

ALMEDA CONSOLIDATED MINES CO.—Preparations are being made at the smeltery for another run. Copper matte was recently shipped.

LELAND CONSOLIDATED MINING CO.—The new development work at this placer mine is progressing rapidly and several giants are in operation.

HORSESHOE BAR—Three giants are in operation and more will be in operation as soon as the development work now in progress is completed. Supplies are being brought in from Galice. A. V. Lewis is manager.

Lane County

COMBINATION MINING CO.—The recently made strike is richer than first reported. The shoot is large and the silver-gold ore can be readily concentrated. Sherman Clark is manager.

UTAH

Beaver County

SOUTH UTAH—A car of zinc concentrate produced by this company's mill from Horn Silver dump ore has recently been shipped to the market.

MOSCOW—This company has just paid its third dividend of $8200 for the year, making a total of dividends paid, amounting to about $40,000.

Juab County

SHIPMENTS FROM TINTIC for the week ended Mar. 22 amounted to 181 cars.

DRAGON—The drift on the 800 level has cut porphyry, and this work has been suspended pending the building of a bulkhead door to keep out the water. Later it is stated electrical equipment will be installed on the 800 level.

IRON BLOSSOM—About 150 tons daily are being shipped, with most of the ore coming from the No. 1 workings. Lead-silver ore has been opened in raising below the main upper levels. Development on the 1900-ft. level from the No. 1 shaft is meeting with encouraging results.

Summit County

PARK CITY SHIPMENTS for the week ended Mar. 22 were 2,865,945 pounds.

RED WARRIOR—Some ore is being shipped from this property.

SILVER KING CONSOLIDATED—A contract has been given to McIlwee & Co., of Denver, for sinking this company's shaft from the 1300- to the 1800-ft. level.

DALY—A hoist is being installed at the No. 2 shaft from which place prospecting will be done. The shaft is 1350 ft. deep, and is within 350 ft. of connecting with the Ontario drain tunnel.

SILVER KING COALITION—The cable of this company's tramway broke recently. Repairs will soon be completed, and operations resumed. A new electric compressor, and a telephone system throughout the mine are being installed. A dividend of 15c. per share has been declared, payable Apr. 15. This calls for a distribution of $187,500.

Salt Lake County

WORK ON A RAILROAD BETWEEN SANDY AND WASATCH will begin as soon as the weather permits. The upper terminus will be about three miles below Tanner's Flats, which marks the end of the Michigan-Utah tramline. In this way the Cottonwoods will be supplied with needed transportation facilities.

BINGHAM MINES—There is stated to have been $145,057 in the treasury Jan. 1, 1913. With this and proceeds from the sale of the Midvale smeltery, as well as receipts from two recent dividends paid by the Eagle & Blue Bell, a subsidiary company, it is said that on May 1 the company will pay off about $200,000 of its bonded indebtedness. First mortgage bonds would thus be reduced from $455,000 to $255,000, leaving a second mortgage bond of $577,789. There are 55,444 shares of stock in the treasury worth about $1.10 per share.

WASHINGTON

Kittitas County

PLACER GOLD HAS BEEN FOUND IN BURBANK CANYON near Ellensburg, in paying quantities, and several prospectors are testing nearby ground.

Ferry County

A TRANSMISSION LINE IS BEING BUILT to connect the North Washington Power & Reduction Co., at Republic, with the Cascade & Bonnington Falls line at Carson, British Columbia.

LONE PINE—This mine is now making daily shipments of 50 tons of ore to the San Poil mill, and about 300 tons weekly to the Trail smeltery. The ore assays about $12 per ton.

Stevens County

ST. CRISPIN—Development work is being done on this property at Northport. The ore contains copper and some gold.

WYOMING

Natrona County

FRANCO PETROLEUM CO.—This company has been chartered with a capital of $6,000,000, of which $4,000,000 is preferred stock. It will take over the Natrona County Pipe Line & Refinery Co. and the Dutch Maataschappi Petroleum Co. The new company will control all the territory formerly owned by these companies, as well as a 5000-bbl. daily capacity refinery at Casper. W. D. Brooks has resigned as president and general manager of the Midwest Oil Co. to become the president of the new company.

CANADA

British Columbia

GALENA FARM—Preparations are being made for resuming operations at this property near Silverton.

FIRST THOUGHT—Sir Donald Mann has bought the interest of Patrick Burns in this property. The milling ore will be tested in order to determine the best method for its treatment.

DRY HILL HYDRAULIC CO.—The property of this company covering 2½ miles of placer leases on Lorn Creek bottoms, has been bonded by a syndicate in which H. Carpenter, B. J. Carpenter, M. P. Revesbech and William Tuttle are interested.

YANKEE GIRL—Shipments from this mine at Ymir have been increased steadily and now average three carloads per week. The ore comes from a stope opened at the end of a tunnel where the vein is wider than in the drift. J. W. Boskett is general manager.

Ontario

REPORTS OF A RICH SILVER STRIKE on Flint Creek, east on the Transcontinental Ry., have reached Cochrane. Prospectors are going to the Hurricanaw River country; it is thought that a camp will be started there this summer.

Ontario-Cobalt

CASEY COBALT—The 25-ton stamp mill was recently started. The capacity of this mill is shortly to be increased to 50 tons per day.

BEAVER—A strike, due to the discharging of an employee, has been declared on this property; all underground work has ceased. The mill is still running.

CITY OF COBALT—An injunction has been granted to restrain the sale of this property to C. A. Irwin for $750,000, on behalf of the shareholders who claimed that $900,000 could be obtained for the property.

SHIPMENTS or ore and concentrates in tons, from Cobalt mines for the week ended Mar. 29 were as follows:

Bailey	.....	Kerr Lake	.....
Beaver	.....	La Rose	40.63
Buffalo	.....	Lost and Found	.....
Casey Cobalt	.....	McKinley-Darragh	65.94
Chambers-Ferland	.....	Nipissing	13.22
City of Cobalt	.....	Nipissing Reduction	.....
Cobalt Lake	32.30	O'Brien	.....
Cobalt Townsite	.....	Penn.-Canadian	.....
Colonial	.....	Provincial	.....
Coniagas	47.35	Right of Way	.....
Crown Reserve	20.00	Seneca Superior	.....
Dominion Reduction Co.	.....	Silver Queen	.....
Drummond	.....	Timiskaming	19.80
General Mines	.....	Trethewey	.....
Green Meehan	.....	Wettlaufer	.....
Hargraves	.....		
Hudson Bay	32.30	Total	271.54

Ontario-Porcupine

HURD—It is reported that development work will be started.

TOUGH-OAKES—This property, South of Gull Lake, has been purchased by a Haileybury Syndicate.

FOSTER-TOUGH—The shaft on this property is 55 ft. deep. The vein at this point is about 11 in. wide and runs about $500 to the ton.

HOLLINGER—During the four weeks ended Feb. 25, the mill treated 9240 tons, or an average of 330 tons per day. The average assay value of the ore treated was $27.76 per ton. The total extraction was 97%. Milling costs were $1.49 per ton; $180,000 have been paid out in dividends this year, and there is a surplus in the treasury of over $400,000.

MEXICO

Sonora

OPERATIONS AT CANANEA HAVE BEEN DISCONTINUED and no attempts will be made to resume work until supplies can be taken into town. State troops have taken Cananea from the federals. There has been no property loss, but because of the confiscation of supplies by the rebels the Southern Pacific has refused to move cars across the border.

LUCKY TIGER—In February 1967 tons of ore was treated in the old mill and 3049 tons in the stamp mill, while in the cyanide plant 4813 tons of current and 1617 tons of old tailings were treated. The total value of the production was $113,576, of which $47,645 is estimated to be the profit for the month.

PROVIDENCIA MINING & MILLING CO.—This company operating the Tajo de Dolores mine and reduction plant, reports a gross production in 1912 of approximately 627,790 pesos. The profits for the year were approximately 105,517 pesos. During the year 16,193 pesos were spent on new construction at the mill and 5909 pesos on other new work.

SOUTH AMERICA

Colombia

VETA MINING CO.—This company was recently organized in Bogota to exploit gold properties in the north of Ibague, near the headwaters of La China River in the central cordillera. A 30-ton cyanide plant is being built.

THE MARKET REPORT

METAL MARKETS

NEW YORK—April 2

The metal markets have been rather quiet again, but with some increase in strength. Copper has advanced.

The New York Metal Exchange at its annual meeting, Mar. 31, elected officers as follows: President, A. B. Hall; vice-president, Edwin Groves; treasurer, Robert L. Crooke. Members of the Board of Managers: B. Hochschild, H. W. Hendricks, E. Baerwald, W. Parsons Todd, Erich Benjamin, J. H. Lang, Charles J. Marsh, Humphrey D. Bond. Arbitration Committee: P. R. Jennings, Julius Loeb, W. Fisher, B. Elkan, C. S. Trench. Inspectors of election: C. H. Bolles, Jr., Fred Steiner, J. J. Archer.

Copper, Tin, Lead and Zinc

Copper—The clearing of the political horizon in Europe and the accompanying relaxation in the tension which has prevailed for some weeks in the money market there, have brought about an improvement in general business conditions, which found pronounced reflection in the copper market during this week. Consumers bought on a very liberal scale, and for the first time for some months past relinquished their reserve and placed orders for delivery over the next 90 days. The improvement abroad induced also some buying for home trade, which, however, has been on a relatively small scale.

The low prices established about Mar. 25-26 interested buyers, the European especially. At the beginning of Mar. 27 they started to make purchases on a more liberal scale, and their buying was in sufficient volume to lead sellers to advance their prices. On Apr. 1 the price of 15¼c., delivered, usual terms, became well established. The aggregate of the business transacted during the week was large, but it fell off somewhat when the market rose above 15c. By far the major part of the business appears to have been done for export to Europe, whence the buying movement originated, but American manufacturers participated in the buying to some extent. There was also increased buying of Lake copper, special brands of which fetched as high as 15⅜ cents.

The close is firm at 15⅛@15⅜c. for Lake copper, and 15.05@15.10c. for electrolytic. We quote casting copper nominally at 14.70@14.75c. as an average for the week.

Buying for all accounts, and particularly liberal covering on part of the bears, resulted in a sharp advance in the London standard market, which closes steady at £67 13s. 9d. for spot, and £67 17s. 6d. for three months.

Base price of copper sheets is 21@22c. per lb. Full extras are charged, and higher prices for small quantities. Copper wire is 16½c. carload lots at mill.

Copper exports from New York for the week were 6986 long tons. Our special correspondent gives the exports from Baltimore at 2458 tons for the week.

Visible stocks of copper in Europe, March 31, are reported as follows: Great Britain, 22,530; France, 3530; Rotterdam, 5550; Hamburg, 4860; Bremen, 2450; total, 38,920 long tons, or 87,180,800 lb. In addition there is reported afloat from Chile, 2220; from Australia, 4000 tons, making a total of 45,140 tons. The stocks here given are increased by the inclusion of those at Bremen, which have not been reported heretofore.

Tin—The London market at the end of last week was subject to large fluctuations. On Mar. 27, it advanced about £5, only to decline to the same extent the next day. On Monday of this week, however, the advance was resumed on the announcement of the very heavy American deliveries during March, presaging extremely favorable statistics for the month. These were published on Apr. 1, and surpassed the most optimistic predictions. The market retains its firm tone, and closes at £219 for spot, and £215 for three months, and at about 48c. for April tin here.

Visible stocks of tin on March 31 are reported as follows: London, 4172; Holland, 2058; United States, excluding Pacific ports, 4902; total, 11,132 long tons, a decrease of 1132 tons during March.

The Banka auction sale at Amsterdam, Mar. 26, disposed of 2450 tons of tin at an average price of 131.75 florins, which is equal to about 48c., c.i.f. New York.

Lead—The market is quiet and unchanged at 4.15@4.20c. St. Louis, and 4.30@4.35c. New York.

The London market fluctuated within narrow limits and closes unchanged at £16 7s. 6d. for Spanish lead and 7s. 6d. higher for English.

Spelter—The floods in the Middle States cut off quite a number of the heaviest consumers, and in a great many cases resulted in a temporary shutdown of their plants. The market is therefore exceedingly narrow and closes barely steady at 5.65@5.75c. St. Louis, and 5.80@5.90c. New York.

The London market is higher at £25 for good ordinaries, and £25 7s. 6d. for specials.

Jan. 28 the base price of zinc sheets was cut ¼c., and is now $8 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

DAILY PRICES OF METALS

NEW YORK

Mar.-Apr.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
27	4.8700	57½	14¾ @15	14.60 @14.70	48	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75
28	4.8715	57¾	14⅞ @15½	14.70 @14.80	47½	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75
29	4.8715	58¼	14⅞ @15⅛	14.75 @14.85	47¼	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75
31	4.8710	57⅞	15 @15⅛	14.85 @14.95	48	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75
1	4.8700	57⅞	15⅛ @15⅛	14.90 @15.10	48	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75
2	4.8700	57⅞	15⅛ @15⅛	15.05 @15.10	48	4.30 @4.35	4.15 @4.20	5.80 @5.90	5.65 @5.75

The quotations herein given are our appraisal of the market for copper, lead, spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Mar.-Apr.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
20	26⅛	66	66½	71	219½	213½	16⅝	24¾
21	26 5/16	66¾	66⅞	72	215	211¼	16⅝	24¾
22	26 5/16	....	....	....	....	....	....	....
24	26½	67½	67⅞	73½	219	214¾	16¾	25
25	26⅛	67½	67⅞	73½	219	215	16 7/16	25
26	26 7/16	67 11/16	67⅞	73½	219	215	16¾	25

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb, except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, pot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 21¾c.

Other Metals

Aluminum—The market has been active, and supplies for spot or near-by delivery are rather scarce. We quote 27¼ @27¾c. per lb. for No. 1 ingots, New York, for spot.

Antimony—The market continues dull, hardly more than a retail business doing. Prices are unchanged, Cookson's being quoted at 9@9.25c. per lb. and Hallett's at 8.50@8.75c.; while 7.90@8.25c. is asked for Hungarian, Chinese and other outside brands.

Quicksilver—The market remains rather quiet, and there is no material change in prices. The New York quotation may be given at $39@40 per ask of 75 lb., with 58@59c. per lb. for small lots. San Francisco $40 for domestic orders and $37.50 for export. London price is £7 10s. per flask, with £7 5s. named from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Nickel—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

Selenium—Producers of this metal quote large lots at $2.75@3.50 per lb., according to size of order; while as high as $4.50@5.50 is paid for retail lots.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London was unchanged at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. No more gold was taken in New York for export, but more is expected to go to South America.

Iridium—Demand continues to outrun the supply, and prices remain high, $85 per oz. being generally held by dealers.

Platinum—The market here is unchanged, with a steady business. Dealers ask $45@46 per oz. for refined platinum and $49@53 per oz. for hard metal.

The latest London quotation for ingots is £88@90 per long ton—equal to 19.12@19.55c. per lb.—for No. 1 ingots.

Our Russian Correspondent reports, under date of Mar. 20, that demand is good, especially for small lots. Stocks of metal are small and are firmly held, owners expecting higher prices. Current quotations are 9.70 rubles per zolotnik at Ekaterinburg for small lots of crude metal, 83% platinum; 37.700 rubles for pood at St. Petersburg for the same grade. These prices are equal to $36.47 and $36.95 per oz,, respectively.

Russian official returns give the production of platinum in the Urals in 1912 at 177,375 oz., a decrease of 8006 oz. from 1911. This is the figure returned, but it is probable that the total would be increased largely if the metal surreptitiously mined and sold, without reporting it to the government inspectors could be included. It is naturally impossible to do this, so the government figures are given.

Silver shows at present very little rallying power. The metal is absorbed, but the tendency is not bullish, and there does not seem to be much going on in a speculative way.

Exports of Silver from London to the East Jan. 1 to Mar. 19, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£1,545,300	£1,994,000	I. £448,700
China	400,000	95,000	D. 305,000
Total	£1,945,300	£2,089,000	I. £143,700

Shipments of gold from London to India were £247,500 for the week.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—March 29

The report for March 22, delayed in transit, shows for zinc ore $49 highest premium price; base prices, 60% ore, $45@48. Base price, 80% lead ore, $52@53. Shipments for week 1,789,330 lb. zinc ore, 119,300 lb. lead ore and 1,078,000 lb. sulphur ore. Deliveries to concentrating plants, 1,433,900 lb. zinc ore. Shipments were light on account of bad condition of roads.

For the week ended March 29 the base price paid for 60% zinc ore was $42@45. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED MAR. 29

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	1,721,130		1,684,760
Year to date	38,032,410	1,638,440	14,560,160

Shipped during week to separating plants, 1,807,480 lb. zinc ore.

JOPLIN, MO.—Mar. 29

The high price of zinc blende is $49, the base per ton of 60% zinc ranging from $40 to $46. Calamine sold at $23@26 per ton of 40% zinc. The average of all grades is $42.20, a decline of $3.66 per ton. Lead sold as high as $55.50 on a base of $53.50 per ton of 80% metal contents. The market was strong and unchanged. Average of all grades, $53.20 per ton.

An unseasonable fall of 10 in. of snow made wagon hauling next to impossible, followed, as it was, by a speedy thaw. Except where short hauls prevailed, a large tonnage of ore purchased is left in the bins. The large shipment of calamine is from reserve stock, as little of this grade ore was produced this week.

SHIPMENTS, WEEK ENDED MARCH 29

	Blende	Calamine	Lead Ore	Value
Totals for week...	7,868,360	1,084,440	1,610,760	$231,841
Three months.....	131,231,660	9,664,450	24,162,940	3,995,224

Blende value, the week, $174,000; three months, $3,218,768.
Calamine value, the week, $14,992; three months, $138,248.
Lead value, the week, $42,849; three months, $638,208.

OTHER ORES

The market for the raw ores seems to be in an unsettled state. Vanadium ore, apparently, is in too large supply, and it is difficult to find purchasers. Molybdenite. on the other hand, is in demand, and good-grade ore, concentrated up to a high content in molybdenum sulphide, commands a high price. Sales are made on assay, so that no general quotations can be given.

IRON TRADE REVIEW

NEW YORK—April 2

The floods in the West have interfered with production in the steel mills, causing stoppages in a number of mills owing to actual flooding of the works. So far as can be learned, however, there have been few cases where any serious damage has been done. At a number of mills and furnaces delay and stoppage have been due to breaks on the railroads, preventing deliveries of coke. The same cause has given rise to much delay in shipping material, and will cause further pressure from customers for deliveries.

Apart from this trouble, which is for the most part temporary, the condition of the steel trade shows little change. New orders and inquiries are on the increase, and the prospects are for a continued activity through the coming months. Structural steel promises heavy business after the brief lull of the past two or three weeks. Some extra rush is expected for material to repair railroad and bridge damages, which extend over a considerable territory.

Pig iron is still rather a hesitating market, but consumers seem to be preparing to place new orders, and many believe that the coming month will see larger business. Prices are a little unsettled, but there is no disposition to make any important concessions. A number of furnaces in the Middle West are reported banked on account of short supplies of coke.

Exports and Imports of Iron and Steel and of manufactures thereof in the United States in January are valued by the Department of Commerce and Labor as below:

	1912	1913	Changes
Exports	$17,778,287	$25,141,409	I. $7,363,128
Imports	2,404,429	2,860,510	I. 456,081
Excess, exports	$15,373,852	$22,280,899	I. $6,907,047

Exports of mining machinery, included in the totals, were valued at $420,773 in 1912, and $805,063 this year.

In January, 1913, the total exports of commodities for which weights are given were 249,523 tons, an increase of 13,570 tons over 1912. The imports were 21,739 tons, an increase of 509 tons.

PITTSBURGH—Apr. 1

A larger proportion of the iron and steel producing capacity of the Central West was affected by flood than could be anticipated when last week's report was written. Practically the entire Mahoning and Shenango valleys were closed by the middle of last week. On Wednesday and Thursday the Pittsburgh district was slightly affected, there being closed on the Allegheny river two small independent steel plants, four blast furnaces of the Steel Corporation, and the corporation's Union mills; on the lower Monongahela river, the Soho plant of Jones & Laughlin, relatively small, and the Continental and Pennsylvania plants of the National Tube Co., the large steel plants up the Monongahela not being af-

fected, and on the Ohio below Pittsburgh the rod mills and tin mills at the Aliquippa plant of Jones & Laughlin. On Saturday the crest reached the Wheeling district, and closed practically all the plants, including those at Steubenville. The highest water did not reach Cincinnati until this morning, closing practically everything there. Various interior Ohio plants were closed, by great floods in small streams. Plants closed represented almost 30% of the country's total capacity in both pig iron and steel. In steel finishing, more than 50% of the sheet mills west of the Alleghany mountains, and nearly 60% of the tinplate mills, were closed, a few of these being closed not by water at the plants, but by lack of coal or steel.

The Pittsburgh district and the Mahoning and Shenango valleys began to clean up at the close of the week, and some plants are already running, while nearly all expect to make a start before the close of this week. In the Wheeling district no start will be made before next Monday, and at points farther down the time will be still later.

The loss of tonnage is represented by a great deal more than the time the plants are entirely out of commission, that time averaging not more than about ten days, because it will require several weeks for them to speed up to their former rate, and the loss of tonnage will probably be represented by a total of about three weeks at full production by the plants affected, say 30% of the country's total, on an average. There are losses in addition to this estimate, by a few blast furnaces having been chilled, and requiring shoveling out, involving about three weeks time, and perhaps relining also, which would add perhaps five weeks more.

The districts affected produce at least three times as much material as they consume, so that there is a serious curtailment in supply, when for about six months the steel industry had already been running at full capacity, with demand promising to keep it up to capacity for many months more, so that the period of full activity is now prolonged. In addition, the flood damage creates considerable new demand for steel, particularly for bridges, the railroads being more seriously crippled than the steel mills. At several plants the problem of the next few weeks is not of getting the plant into shape for resumption, but of securing supplies of raw material, particularly coal.

Pig Iron—There is no pig-iron market developed since the flood, but prospects are that the market will be stiffened. Last week's prices are repeated as representing the market nominally: Bessemer, $17@17.25; basic, $16@16.25; No. 2 foundry, $16.25; forge, $15.75; malleable, $15.26@16.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh. The bessemer and basic pig iron averages for March, as compiled by a trade interest from actual sales, are announced today at $17.25 for bessemer, showing no change from February, and at $16.059 for basic, showing a decline of 25.8 cents.

There is no Connellsville coke market, consumption having been greatly reduced while production has continued, and coke could doubtless be bought at relatively low figures if there were any demand, which there is not.

Ferromanganese—The market has shown no developments, and we continue to quote prompt and contract at $64@65, Baltimore.

Steel—The floods will accentuate the steel scarcity, if such a thing is possible. While more than 50% of the sheet and tin mills were closed by high water, nearly the entire sheet bar producing capacity was closed, the Sharon, New Castle, Ohio, Mingo, Bellaire and Columbus plants of the Steel Corporation and the two independent plants at Youngstown. Steel prices are purely nominal and we repeat former quotations of $29 for billets and $30 for sheet bars and rods, f.o.b. maker's mill, Pittsburgh or Youngstown.

IRON ORE

A contract is reported made by a Philadelphia concern, the Alan Wood Iron & Steel Co., with the Canadian-Venezuelan Ore Co., for 500,000 tons of iron ore from Venezuela, the deliveries to run over five years.

The 17 Lake vessels formerly owned by the Gilchrist Transportation Co. and recently sold at public sale, will, it is said, be transferred by the creditors' committee to a new company in which Pickands, Mather & Co., of Cleveland, will be the leading factor.

CHEMICALS

The general market is perhaps a little less active, but is for the most part in good condition.

Arsenic—The market continues dull with supplies sufficient for the trade. Prices are rather steady, $4@4.12½ per 100 lb. being asked.

Copper Sulphate—Trade is fairly steady and seems to be improving. Quotations are unchanged at $5.25 per 100 lb. for carload lots, and $5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—Demand is improving a little, though spring trade is not as active as was expected. Quotations are about the same, 2.62½c. per lb. for April; 2.60c. for May; 2.57½c. for June, and 2.55c. for July and later deliveries.

PETROLEUM

California oil production in February is reported at 7,302,751 bbl.; deliveries, 6,667,029 bbl.; stocks, March 1, were 47,389,610 bbl. There were 57 new wells completed in February, and 356 in progress at the close of the month.

COPPER SMELTERS' REPORTS

This table is compiled from reports received from the respective companies, except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield thereof is reckoned at 95%. In computing the total American supply duplications are excluded.

	Dec.	Jan.	Feb.	March
Alaska shipments	3,766,029	1,668,328	660,250	.....
Anaconda	23,400,000	21,000,000	21,250,000	.....
Arizona, Ltd.	3,100,000	3,100,000	3,000,000	.....
Copper Queen	8,805,568	7,554,966	6,810,706	.....
Calumet & Arizona	5,840,000	4,750,000	4,050,000	.....
Chino	3,368,850	2,903,030	3,813,998	.....
Detroit	2,389,875	1,769,071	1,689,277	.....
East Butte	1,314,021	1,469,000	.....	.....
Mammoth	1,850,000	.....	.....	.....
Giroux	625,000	.....	.....	.....
Mason Valley	1,550,000	1,575,100	.....	.....
Nevada Con.	3,975,631	4,169,705	4,798,531	.....
Ohio	566,816	.....	.....	.....
Old Dominion	2,727,000	2,727,000	2,381,000	.....
Ray	3,638,500	3,610,000	3,610,000	.....
Shannon	1,361,420	1,232,000	1,152,000	.....
South Utah	*nil*	.....	.....	.....
United Verde*	3,000,000	2,900,000	2,750,000	.....
Utah Copper Co.	5,676,484	7,182,495	7,585,303	.....
Lake Superior*	18,300,000	17,500,000	19,000,000	.....
Non-rep. mines*	7,750,000	7,500,000	.....	.....
Total production	103,005,194	.....	.....	.....
Imports, bars, etc.	28,761,087	34,026,236	.....	.....
Total blister	131,766,281	.....	.....	.....
Imp. in ore and matte	10,385,662	7,563,758	.....	.....
Total American	142,151,943	.....	.....	.....
Miami†	2,913,840	2,932,369	2,817,200	.....
Brit. Col. Cos.:				
British Col. Copper	.....	.....	.....	.....
Granby	.....	1,792,245	1,740,000	.....
Mexican Cos.:				
Boleo†	2,480,240	2,658,880	2,535,680	.....
Cananea	5,592,000	.....	4,880,000	.....
Moctezuma	2,793,781	2,913,294	2,730,914	.....
Other Foreign:				
Braden, Chile	910,000	1,484,000	1,178,000	.....
Cape Cop., S. Africa	750,560	770,540	.....	.....
Kyshtim, Russia	1,489,600	1,644,160	.....	.....
Spassky, Russia	974,400	974,400	.....	.....
Exports from				
Chile	7,392,000	6,752,000	5,824,000	.....
Australia	9,856,000	9,744,000	5,512,000	.....
Arrivals in Europe‡	16,363,200	17,689,280	8,509,760	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.
‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
III, '12	125,694,601	67,487,466	58,779,566	62,939,988	141,142,400	204,082,387
IV	125,464,644	69,513,846	53,252,326	62,367,557	136,819,200	199,186,757
V	126,737,836	72,702,277	69,485,945	695,066,02	134,176,000	199,242,029
VI	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	.....	.....	.....	122,302,890	81,244,800	203,547,690
IV	.....	.....	.....	.....	87,180,800	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq	Sale	Amt.
Advance, Ida	Mar. 15	Apr. 15	$ .003
Alta, Nev	Mar. 24	Apr. 14	0.05
Bell, Ida	Mar. 12	Apr. 12	0.01
Blue Star, Wash	Mar. 7	.....	0.001
Caledonia, Nev	Apr. 9	Apr. 29	0.05
Cariboo, Ida	Apr. 5	May 1	0.01
Cedar-Talisman, Utah	Mar. 15	Apr. 5	0.01
Central Eureka, Nev	Mar. 22	Apr. 26	0.02½
Challenge, Nev	Apr. 1	Apr. 22	0.05
Chollar, Nev	Mar. 31	Apr. 24	0.03
Con. Virginia, Nev	Apr. 23	May 14	0.15
Corbin Copper, Mont	.....	Apr. 22	0.50
Crown Point, Utah	Mar. 20	Apr. 15	0.01
Great Falls, Utah	Mar. 22	Apr. 22	0.01
Michigan Cop. & Gold, Utah	Mar. 31	Apr. 22	0.01
Nicodemus, Ore	Mar. 14	.....	0.05
O. K. Silver, Utah	Apr. 15	May 10	0.01
Ophir, Nev	Apr. 16	May 8	0.15
Overman, Nev	Mar. 18	Apr. 8	0.05
Seg. Belcher, Nev	Apr. 8	Apr. 29	0.02
Sierra Nevada, Nev	Apr. 2	Apr. 23	0.100
Silver Shield, Utah	Mar. 10	Apr. 12	0.015
Tar Baby, Utah	Mar. 10	Apr. 7	0.0q
Tonopah Gipsy Queen, Nev	Mar. 31	May 5	0.01
Wabash, Utah	.....	Apr. 10	0.05

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	.....	24.595	27.284	.....
May	53.308	60.880	.....	24.583	28.038	.....
June	53.043	61.290	.....	24.486	28.215	.....
July	52.630	60.654	.....	24.286	27.919	.....
August	52.171	61.606	.....	24.082	28.375	.....
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.766	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	.....	15.930	.....	70.294	.....
May	16.031	.....	16.245	.....	72.352	.....
June	17.234	.....	17.443	.....	78.259	.....
July	17.190	.....	17.353	.....	76.636	.....
August	17.498	.....	17.644	.....	78.670	.....
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.515	238.273
February	12.962	48.766	195.036	220.150
March	12.577	46.832	192.619	213.645
April	43.923	.....	200.513	.....
May	16.063	.....	208.830	.....
June	45.815	.....	205.863	.....
July	44.519	.....	202.446	.....
August	45.857	.....	208.351	.....
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	.....	4.118	.....	16.331	.....
May	4.194	.....	4.072	.....	16.509	.....
June	4.392	.....	4.321	.....	17.588	.....
July	4.720	.....	4.603	.....	18.544	.....
August	4.569	.....	4.452	.....	19.655	.....
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	.....	6.483	.....	25.644	.....
May	6.679	.....	6.529	.....	25.790	.....
June	6.877	.....	6.727	.....	25.763	.....
July	7.116	.....	6.966	.....	26.174	.....
August	7.028	.....	6.878	.....	26.443	.....
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	.....	13.90	.....	14.15	.....
May	15.14	.....	13.90	.....	14.12	.....
June	15.15	.....	14.11	.....	14.22	.....
July	15.15	.....	14.38	.....	14.38	.....
August	15.43	.....	14.90	.....	14.85	.....
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Apr. 1

Name of Comp.	Bid.
Acacia	.02
Cripple Cr'k Con.	.01
C. K. & N.	.12
Doctor Jack Pot	.07
Elkton Con.	.58
El Paso	4.50
Findlay	.04
Gold Dollar	.11
Gold Sovereign	.02
Isabella	.11
Jack Pot	.05
Jennie Sample	.01
Lexington	‡ .008
Moon Anchor	‡ .005
Old Gold	.02
Mary McKinney	.64
Pharmacist	.01
Portland	.98
Vindicator	96
Work	‡ .004

SALT LAKE Apr. 1

Name of Comp.	Bid.
Beck Tunnel	.04
Black Jack	.09
Cedar Talisman	.01
Colorado Mining	.12
Columbus Con.	.05
Crown Point	03
Daly-Judge	6.50
Grand Central	76
Iron Blossom	1.37½
Little Bell	‡ .35
Lower Mammoth	.03
Mason Valley	5.00
May Day	.12½
Nevada Hills	1.05
New York	‡ .005
Prince Con	65
Silver King Coal'n	3.20
Sioux Con.	.03
Uncle Sam	.08½
Yankee	.13

TORONTO Apr. 1

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.09½	Foley O'Brien	.35
Coniagas	7 50	Hollinger	17 25
T. & Hudson Bay	‡64.00	Imperial	.04
Timiskaming	36	Jupiter	.45
Wettlaufer-Lor	12	Pearl Lake	.62
Apex	‡ .02½	Porcu. Gold	.28
Crown Chartered	01	Preston E. D.	‡ 04
Dobie	‡ 15	Rea	.30
Dome	‡17.50	Swastika	.12½
Dome Exten	.11½	West Dome	‡ 24½

SAN FRANCISCO Mar. 25

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	‡ .01
Belcher	‡ .30
Best & Belcher	‡ .03
Caledonia	‡ 15
Challenge Con	‡ .06
Chollar	‡ .01
Confidence	‡ 35
Con. Virginia	‡ 20
Crown Point	‡ .30
Gould & Curry	‡ 03
Hale & Norcross	‡ .08
Mexican	‡ 72
Occidental	‡ 70
Ophir	‡ .17
Overman	‡ .55
Potosi	‡ .02
Savage	‡ 04
Sierra Nevada	‡ .08
Union Con	‡ .11
Yellow Jacket	‡ .24

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	6.60
Jim Butler	.69
MacNamara	.20
Midway	.51
Mont.-Tonopah	1.60
North Star	.23
West End Con	1.36
Atlanta	.16
Booth	.06
C.O.D. Con	.05
Comb. Frac	.06
Jumbo Extension	.26
Pitts.-Silver Peak	.54
Silver Pick	.06
St. Ives	.30
Tramp Con	.01
Argonaut	1.50
Bunker Hill	‡1.50
Central Eureka	.28
So. Eureka	2.50

N. Y. EXCH. Apr. 1

Name of Comp.	Clg.
Amalgamated	74⅜
Am. Agri. Chem	54
Am.Sm.&Ref.,com	71
Am. Sm. & Ref., pf.	104
Am. Sm. Sec., pf. B	85⅛
Anaconda	38⅝
Batopilas Min	1⅛
BethlehemSteelpf	71⅝
Chino	41⅞
Federal M. & S., pf.	33
Goldfield Con	2¾
GreatNor.,ore,ctf.	37
Guggen. Exp.	48
Homestake	101
Inspiration Con	16¾
Miami Copper	24⅛
Nat'nalLead,com.	48¼
National Lead, pf.	105
Nev. Consol.	18
Phelps Dodge	197⅛
Pittsburg Coal, pf.	85
Ray Con	19¼
Republic I&S,com.	26¾
Republic I & S, pf.	86⅛
SlossSheffi'd,com.	36
Sloss Sheffield, pf.	90
Tennessee Copper	36¼
Utah Copper	53⅞
U. S. Steel, com	63
U. S. Steel, pf.	108¾
Va.Car. Chem., pf.	108½

BOSTON EXCH. Apr. 1

Name of Comp.	Clg.
Adventure	2¼
Ahmeek	300
Algomah	1
Allouez	38
Am. Zinc	29¼
Ariz. Com., ctfs.	3¾
Bonanza	.38
Boston & Corbin	7
Butte & Balak	1⅞
Calumet & Ariz	66½
Calumet & Hecla	470
Centennial	16
Cliff	1½
Copper Range	45
Daly West	3½
East Butte	12¾
Franklin	6½
Granby	63¼
Hancock	22
Hedley Gold	32
Helvetia	⅛
Indiana	13¼
Island Cr'k, com	54
Island Cr'k, pfd.	85½
Isle Royale	25¾
Keweenaw	2
Lake	15⅞
La Salle	4¾
Mass	4
Michigan	1¾
Mohawk	52½
New Arcadian	2⅝
New Idria Quick	‡4
North Butte	30¼
North Lake	1⅛
Ojibway	2
Old Dominion	50⅛
Osceola	95
Quincy	71
Shannon	11
Shattuck-Ariz	23¼
Superior	33
Superior & Bost	3¾
Tamarack	34½
Trinity	4¼
Tuolumne	2¾
U. S. Smelting	41
U. S. Smelt'g, pf.	48½
Utah Apex	1¾
Utah Con	9⅛
Victoria	1⅝
Winona	3
Wolverine	64
Wyandot	1

N. Y. CURB Apr. 1

Name of Comp.	Clg.
Barnes King	.95
Beaver Con	.39
Braden Copper	9⅛
B. C. Copper	33⅜
Buffalo Mines	2⅜
Caledonia	‡ 40
Con. Ariz. Sm	⅛
Davis-Daly	2⅛
Diam'field-Daisy	.05
Ely Con	.11
Florence	.48
Giroux	3
Gold Hill Con	‡⅛
Greene Cananea	7⅜
Greenwater	05
Internat. S. & R.	‡117
Kerr Lake	3⅛
Keystone	‡2
La Rose	2¹¹⁄₁₆
McKinley-Dar-Sa	2
Min. Co. of A. new	2⅞
Motherlode Gold	‡.60
Nev. Utah M. & S.	‡ 01
Nipissing Mines	9
Ohio Copper	¾
Pacific Sm. & M.	⅓
Puebla S. & R.	2
South Live Oak	‡2
South Utah M. & S.	⅛
Standard Oil (Old)	‡1110
Stand'd Oil of N.J.	362
Stewart	1½
Tonopah	5⅝
Tonopah Ex	2⅛
Tonopah Merger	.89
Tri-Bullion	7/16
Tularosa	1/16
Union Mines	‡⅛
United Cop., pfd.	10
Yukon Gold	2½

BOSTON CURB Apr. 1

Name of Comp.	Last
Alaska Gold M.	14⅜
Bingham Mines	4
Boston Ely	.70
Boswyocolo	‡ 01
Butte Central	2⅜
Cactus	.10
Calaveras	2⅜
Chief Cons	1⅜
Corbin	.70
Cortez	⅛
Crown Reserve	3⅜
Eagle & Blue Bell	.98
First Nat. Cop	1⅞
Majestic	42
Mexican Metals	97
Moneta Porc	‡.06
Nevada-Douglas	2⅜
New Baltic	1⅜
Oneco	1½
Raven Copper	.15
Rhode Island Coal	.67
Smokey Dev	1⅜
S. W. Miami	3⅜
South Lake	6⅜
Trethewey	‡.42
United Verde Ext.	.70

LONDON Apr. 1

Name of Com.	Clg.
Camp Bird	£0 19s 9d
El Oro	0 15 2
Esperanza	1 8 10
Mexico Mines	‡6 15 0
Oriental Con.	‡1 8 9
Oroville	0 6 9
Santa Gert'dis	‡1 6 3
Tomboy	1 4 2

‡Last quotation.